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TCHERNTZOFF (I. A.). К вопросу о так называемой „скрытой" синеве хвойной древесины. [On the problem of the so-called 'latent' blue stain of coniferous timber.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения Древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collection of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 129–142, Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

Controlled experiments in 1933 [full details of which are given] with ten species of fungi causing blue stain in timber, including *Ceratostomella comata*, *C. acoma*, and *C. imperfecta* [*R.A.M.*, xiv, pp. 270, 271], showed that discoloration of the sapwood of coniferous trees does not immediately follow its invasion by these organisms, with the result that more or less wide zones of 'latent' infection are invariably present in affected material; these zones are always widest in a radial direction, in which the fungi spread most rapidly in the wood. The width of the latent zones was determined both by direct microscopical examination of artificially and naturally infected wood, and by plating out and incubating small shavings of the wood, taken at various distances from the visible boundary of the discoloration; both methods gave fairly consistent results, except with *C. coerulea* and *Trichosporium tingens* [ibid., ix, p. 77], for which the width determined by the second method was considerably greater than by the first.

The zone of latent infection extended much farther (on the average to a width of 3·5 and 5 mm. as determined by the two methods, respectively) in blocks of wood infected with the fungi on their tangential than on their radial surface (0·7 and 1·7 mm., respectively). The species of *Ceratostomella* developed, in general, a wider latent zone than the other species investigated, this being especially marked for *C. piceae* (up to 31 mm.), presumably owing to the weak and late development of pigment in the hyphae of this fungus.

While, with most of the fungi tested, the appearance of blue staining coincided with the darkening of the aerial mycelium, it was much later in *C. piceae*, and considerably earlier in *C. pini* and *T. tingens*; in timber infected with the two last-named species, internal blue stain may be present without any external symptom.

From a practical standpoint, these studies are considered to show that superficial chemical or mechanical treatment (planing) of sawn material is not a guarantee that blue stain may not develop in processed wood if it is subjected to conditions favouring the revival of the dormant infection.

MELIN (E.) & NANNFELDT (J. A.). **Researches into the blueing of ground wood-pulp.**—*Svenska Skogvårdsfören. Tidskr., 1934*, 3–4, pp. 397–616, 59 figs., 1 map, 1934. [Swedish summary.]

This is a very comprehensive and fully tabulated account of investigations (in progress since 1929) on the incidence, etiology, and control of fungal blueing of ground wood-pulp in Sweden [*R.A.M.*, ix, p. 76], the practical side of the work having been in the hands of the senior author while the junior writer undertook the taxonomic studies.

A consideration of the systematic affinities of the fungi commonly referred to the genus *Ceratostomella* has led to the transference of certain species to *Ophiostoma*, of which two new sections are distinguished, with Latin diagnoses, viz., *brevirostrata* Nannf., characterized by short, broad perithecial beaks and conidiophores of the *Cephalosporium* and *Cladosporium* types, and *longirostrata* Nannf., with long, conical or capilliform beaks and conidiophores resembling either those of *Chalara*, *Thielaviopsis* or (occasionally) *Graphium* or else similar to those of the first section. To the first section belong *O.* (*Ceratostomella*) *pini*, *O. minus* (*C. minor*), and *O. exiguum* (*C. exigua*). To the first group of the second section (endoconidia of the *Chalara* type) belong four species—*O.* (*Endoconidiophora*) *coerulescens*, *O. adiposum* (*C. adiposa*) [ibid., xii, p. 355], *O. fimbriatum* (*C. fimbriata*), and *O. paradoxum* (*C. paradoxa*) (all new combinations), while the second group (exogenous *Cephalosporium*- or *Cladosporium*-like conidia) comprises five species with known *Graphium* stages, viz., *O.* (*C.*) *piceae*, *O. canum* (*C. cana*) [ibid., viii, p. 345], *O.* (*C.*) *quercus* (Georgév.) Nannf. n.comb. [ibid., vii, p. 286], *O. merolinense* Nannf. n. comb. (*C. merolinensis* Georgév.) [ibid., x, p. 277], and *O.* (*C.*) *ulmi* (Buism.) Nannf. n.comb. [ibid., xi, p. 409], and ten of which the *Graphium* stage has not yet been recognized, including *O. coeruleum* (*C. coerulea*), *O. pluriannulatum* (*C. pluriannulata*) [ibid., xii, p. 669], *O. piliferum* (*C. pilifera sensu* Hedgc.), *O.* (*C.*) *fagi* Nannf. n.comb. [ibid., xii, p. 665], *O.* (*C.*) *castaneae* Nannf. n. comb. [ibid., xi, p. 681], *O.* (*C.*) *ips* (Nannf.) n.comb. [ibid., xiv, p. 68], and *O.* (*C.*) *stenoceras* Nannf. n.comb. [ibid., xii, p. 69]. The genus *Ceratostomella* proper (as exemplified by *C. vestita* and *C. cirrhosa*, but to which *C. pilifera* was wrongly referred by early writers) is not further discussed. It has already been pointed out that the part played by these and allied organisms in the blueing of timber and discoloration of wood-pulp is liable to exaggeration. During these investigations only the three species *O. coeruleum*, *O. piceae*, and *O. stenoceras* were encountered.

Discula pinicola [loc. cit.] was the only member of the five Sphaeropsideae isolated that calls for mention; it was obtained from the water in two of the mills inspected.

Seven species of *Cadophora* were investigated in connexion with the work, six of which are new and furnished with Latin diagnoses, namely, *C. americana* Nannf. n.sp. from wood-pulp in the United States (not

found in Sweden), *C. lagerbergii* Melin & Nannf. n.sp. from pine wood in Sweden, *C. melinii* Nannf. n.sp. from wood-pulp in Sweden, *C. obscura* Nannf. n.sp. from water in Sweden, and *C. richardsiae* Nannf. n.sp. from wood-pulp in the United States and Sweden. *C. fastigiata*, one of the commonest species, was repeatedly isolated not only from pulp but also from water and air. The other fungi concerned in the discoloration of pulp or present in the surrounding atmosphere or water were *Cladosporium* (*Hormodendrum*) *elatum* (Harz) Nannf. n.comb. [cf. ibid., xiv, p. 69], *C. herbarum*, *Haplographium penicillioides*, *Lecythophora lignicola* Nannf. [loc. cit.] (with Latin diagnoses of the genus and species), *Oidiodendron griseum* Robak n.sp. (Latin diagnosis), *O. fuscum*, *O. nigrum* [ibid., xii, p. 69], *Pullularia pullulans*, *Rhinocladiella atrovirens* Nannf. n.g. n.sp. (Latin diagnoses), in connexion with which is given a detailed discussion of the allied forms with 'radula spores' *sensu* E. W. Mason, some of these being regarded as probably imperfect stages of Basidiomycetes, and *Trichosporium heteromorphum* Nannf. n.sp. (Latin diagnosis) [ibid., xiv, p. 69], a widely distributed species in Sweden and occurring also in Norway and Finland.

Regarding the relative frequency of the species, *Cadophora fastigiata*, *L. lignicola*, *P. pullulans*, and *T. heteromorphum* were found in the majority of the seventeen mills investigated. The most important of the rarer blueing fungi were *C. melinii*, *C. obscura*, *C. richardsiae*, *Cladosporium herbarum* (which caused the most intensive greyish-blue to black staining on sterilized wood-pulp), *H. penicillioides*, and *R. atrovirens*. Up to 1,000,000 spores per gm. of dry wood-pulp were sometimes found. *Cadophora fastigiata* and *T. heteromorphum* caused dark greyish-green stains, often with a tint of blue, *P. pullulans* an intense stain of the same colour or turning to greyish-brown, while *L. lignicola* and some strains of *C. fastigiata* formed small greyish to greyish-green stains.

The factors governing the occurrence of blue stain are very fully considered with reference to the practical possibilities of control, among which may be mentioned the introduction into the grinding water either of cultures of certain yeast-like organisms with a known inhibitory effect on the fungi under discussion, e.g., *Geotrichum candidum* [ibid., ix, p. 201] and species of *Blastodendrion*, *Geotrichoides*, *Mycotoruloides*, *Torulopsis*, and *Sporotrichum*, or of chemical preservatives, such as sulphuric acid, paranitrophenol, H146 neu, and sodium chloride.

A six-page bibliography is appended.

Nisikado (Y.) & Yamauti (Y.). **Contributions to the knowledge of the sap stains of wood in Japan. II. Studies on Ceratostomella pini Münch, the cause of a blue stain of Pine trees.**—*Ber. Ōhara Inst. Landw. Forsch.*, vi, 3, pp. 467–490, 5 pl., 1934.

Continuing their studies on the sap stains of wood in Japan [*R.A.M.*, xii, p. 606], the writers fully describe and tabulate the results of their morphological and physiological investigations on *Ceratostomella pini* [see preceding abstracts], commonly found on *Pinus densiflora* and *P. thunbergii*.

The fungus (which is strictly aerobic) attacks not only felled timber but standing trees weakened by bark beetles or other agencies. As in

C. ips, the hyphae penetrate the parenchymatous cells of the medullary rays from the cortex towards the centre, growing longitudinally through the resin ducts and tracheids and tangentially through the bordered pits. In morphological characters the Japanese material of *C. pini* was found to agree well with Münch's description. On standard culture media at 25° C. its growth was much more profuse than that of *C. ips* and *C. piceae*. The conidia of *C. pini* were killed by 15 and 5 minutes' immersion, respectively, in water at 52° and 54° and by one hour in 1 in 6,000 mercuric chloride or 1 in 200 formalin; growth of the fungus was retarded in 1 per cent. malt extract solution by the addition of 1 in 100,000 mercuric chloride and 1 in 10,000 iron sulphate or uspulun.

WATERMAN (R. E.), KOCH (F. C.), & MCMAHON (W.). **Chemical studies of wood preservation. III. Analysis of preserved timber.**—*Indus. & Engin. Chem.*, Analyt. Ed., vi, 6, pp. 409–413, 4 figs., 1 diag., 1934.

Full technical details are given of the analytical methods devised at the Bell Telephone Laboratories, New York, for the examination of timber, treated either by creosoting or with inorganic salts [cf. *R.A.M.*, xiv, p. 139] for the prevention of decay. These methods are adapted, on the one hand, to the appraisal of freshly treated poles for quantity and extent of distribution of the preservative and, on the other, to determining the extent of depletion during years of exposure. The manner of recovery of creosote from old timber and methods for the analysis and toximetry of this substance (calculated mainly in reference to *Fomes annosus*, *Lentinus lepideus*, *Poria incrassata*, and *Coniophora cerebella* [*C. puteana*] on the lines laid down at the Forest Products Research Laboratory, Madison, Wisconsin) [ibid., iv, p. 579] are described.

WATERMAN (R. E.) & WILLIAMS (R. R.). **Chemical studies of wood preservation. IV. Small sapling method of evaluating wood preservatives.**—*Indus. & Engin. Chem.*, Analyt. Ed., vi, 6, pp. 413–418, 2 figs., 6 diags., 1934.

In order to expedite tests of the permanency of telephone-pole preservatives [see preceding abstract], use is made of groups of small southern yellow pine [*Pinus palustris*] saplings treated with the substance to be judged and set in the ground as miniature poles. In such specimens weathering is relatively rapid by reason of the large ratio of surface to volume, and poorly preserved material begins to decay after a year or two. Periodical analyses, toxicity tests, and observations on decay are made. Seven years' experience indicates that the comparative preservative values of various salts, creosotes, oils, and the like may be estimated fairly cheaply, quickly, and with considerable reliability by this method.

REINMUTH (E.). **Beiträge zur Frage der Gemüsesamenbeizung und zur laboratoriumsmässigen Prüfung der Beizmittelwirkung bei Gemüsesamen.** [Contributions to the question of vegetable seed disinfection and the laboratory testing of the action of disinfectants on vegetable seeds.]—*Angew. Bot.*, xvi, 6, pp. 441–504, 15 graphs, 1934.

Following a general account of the theoretical and practical aspects of vegetable seed disinfection against a number of diseases known to be

perpetuated by the seed [cf *R.A.M.*, xiii, p. 740; xiv, p. 48], and of the methods employed in the routine laboratory testing of the various preparations such as germisan, uspulun, ceresan, and formaldehyde liquids and abavit B, tillantin R, ceresan, and tutan dusts, commonly used for this purpose, the writer fully discusses and tabulates the results of his experiments at the Rostock Agricultural Experiment Station in the seed disinfection of red and white cabbage and kohlrabi, celery, tomato, onion, leek, and lettuce.

At the normal germination temperature of 20° C. the cabbage seed did not prove unduly susceptible to the action of the standard disinfectants used; at 30° germinative capacity was impaired except in the case of formaldehyde. Kohlrabi was more liable to be adversely affected by the treatments at high concentrations. Ceresan and uspulun (liquid) were practically non-injurious to celery, even at high strengths. Tomato seed was found to be extremely sensitive to the action of liquid disinfectants, germisan being the sole mercury-containing preparation that proved to be suitable for this purpose and then only at a moderate temperature. Dusts were less detrimental. Both onions and leeks responded satisfactorily to disinfection even at raised concentrations. In order to secure uniform moistening of lettuce seed with the liquid preparations it was found advisable to immerse it beforehand for 30 minutes in a 1 per cent. soft soap solution. The therapeutic efficacy of the various preparations was calculated by means of a modification of E. G. Pringsheim's method involving the addition of 2 per cent. agar to the sugar bouillon solution used for germination [ibid., vii, p. 733].

Brejneff (I. E.). Влияние вносимых в почву удобрений на развитие болезней Капусты. [Effect of applications of soil fertilizers on the development of Cabbage diseases.]—*Труды Ленинградск. Общ. Естествоиспытателей.* [*Trav. Soc. Nat. St-Pétersb.* (*Leningr.*)], lxiii, 1, pp. 83–109, 4 graphs, [1934. French summary.]

A detailed account is given of experiments in wooden boxes carried out to test the possibility of controlling club root (*Plasmodiophora brassicae*) and downy mildew (*Peronospora brassicae*) [*P. parasitica*: *R.A.M.*, xii, p. 546] of cabbage by applications to the soil of various mineral fertilizers, ranging from chemically or physiologically acid to alkaline substances, and stable manure alone or mixed with lime. The results indicated that nitrogen with or without phosphorus promoted a luxuriant growth of the cabbage seedlings, but also favoured the development of club root to an extent which more than counterbalanced its beneficial action on vegetative vigour. While all the acid fertilizers were favourable to the development of the disease, the neutral or alkaline ones considerably reduced or even completely controlled it, but in most cases had a markedly depressing effect on the growth of the host. It is believed, however, that a good measure of control may be obtained by applying to the soil certain mineral salts, e.g., potassium, calcium, and sodium nitrates, which are both beneficial to the plant and have a controlling effect on the club root organism. Under the conditions tested, the Valvatievka variety was markedly more resistant to club root than the Brunswick cabbage.

On the other hand, none of the fertilizers tried had any very marked effect on the development of downy mildew. On general lines, these studies are considered to suggest that mineral fertilizers may be useful in controlling diseases affecting the underground parts, but to a much lesser degree those of the aerial organs of plants, where the parasite is not in direct contact with the substances employed.

GIBBS (J. G.). **Club-root control. Further experiments on the control of club-root in Cabbage seed-beds.**—*New Zealand Journ. of Sci. & Tech.*, xvi, 3, pp. 159–162, 1934.

The results [which are tabulated and briefly discussed] of experiments during 1932–4 on the comparative value of 39 disinfectant treatments against club root [*Plasmodiophora brassicae*] of Succession cabbage and Broad Leaf Essex rape in seed-beds at Palmerston North, New Zealand, indicated that the cheapest and most reliable fungicide is 0·1 per cent. acidulated mercuric chloride solution at 2 galls. per sq. yd. [*R.A.M.*, xii, p. 412]. The cost of the treatment in 1933–4 was estimated at under 2½*d.* per sq. yd. Mercurous chloride at the same strength also gave good control of *P. brassicae* but caused yellowing and stunting of the seedlings. Slight infection (3·25 per cent.) occurred at soil depths exceeding 3 in. even in the plots treated with mercuric chloride, which completely sterilized the upper layers.

GUTZEVITCH (S. A.). Заболевание Капусты ,,черная ножка'', **Moniliopsis aderholdi Ruhl.** ['Black leg' disease of the Cabbage, *Moniliopsis aderholdi* Ruhl.]—*Труды Ленинградск. Общ. Естествоиспытателей* [*Trav. Soc. Nat. St-Pétersb.* (*Leningr.*)], lxiii, 1, pp. 69–82, 2 figs., [1934. English summary.]

The author's investigations at Detskoye Selo in 1931 showed that the 'black leg' disease of cabbages, which is very prevalent and causes important losses practically over the whole of the U.S.S.R., though hitherto usually attributed to *Olpidium brassicae* [*R.A.M.*, vii, p. 202], is in reality caused, at least in the region of Leningrad, by the fungus commonly known as *Moniliopsis aderholdi* [cf. ibid., x, p. 416]. Morphological and biological studies [some details of which are given] and a review of the relevant literature, however, lead him to the conclusion that the fungus should be referred to the genus *Rhizoctonia* [cf. ibid., v, p. 193], with which the whole genus *Moniliopsis* should be reunited as it is based on insufficiently distinctive characteristics [cf. ibid., xiii, p. 598].

In pure culture the fungus was shown to be highly resistant to the action of environmental conditions, as it readily withstood a temperature of —18° C. for several weeks and drying out at room temperature for 2½ years; it grew at hydrogen-ion concentrations ranging from P_H 4·94 to 9·18 with a somewhat indistinct optimum between 7 and 7·6. It developed and attacked cabbage seedlings equally well at all the soil moistures tested between 40 and 100 per cent., and it exhibited high tolerance to the action of comparatively large doses of iron sulphate, potassium bichromate, calcium chloride, sulphuric acid, bromine, formalin, and sulphur dust applied as soil disinfectants.

MACDONALD (J. A.). **The life history and cultural characteristics of Typhula gyrans (Batsch) Fries.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 590–613, 3 pl., 34 figs., 1934.

After a brief review of the history of *Typhula gyrans* [*R.A.M.*, vii, p. 701] and of its previous records on various host plants [41 references to which are cited], the author gives full details of his investigations of its life history and pathogenicity in Scotland to swedes and turnips at all stages of development under various conditions. The fact that all attempts to secure infection with it failed, and that in one field experiment nearby rows of cabbage and Brussels sprouts also remained unaffected, is considered to demonstrate that in Scotland the fungus is in all probability only a saprophyte.

The cultural study of *T. gyrans* showed that it is heterothallic, since monospore strains failed to produce clamp connexions, sclerotia, or sporophores when grown alone, but when paired, mixing and fusion of the hyphae occurred in some cases and resulted in the formation of these organs.

HARTER (L. L.), ZAUMEYER (W. J.), & WADE (B. L.). **Pea diseases and their control.**—*U.S. Dept. of Agric. Farmers' Bull.* 1735, 24 pp., 12 figs., 2 maps, 1934.

Popular notes are given on the symptoms, etiology, and control of the principal pea diseases in the United States.

PETHYBRIDGE (G. H.). **Marsh spot in Pea seeds.**—*Journ. Min. Agric.*, xli, 9, pp. 833–849, 4 pl., 1934.

From a brief survey of the literature up to date on the marsh spot disease of peas in England and abroad [*R.A.M.*, xiii, p. 205], supported by some observations and tests made at the Plant Pathological Laboratory, Harpenden, since 1926, the author concludes that the condition is a defect of the pea seed, characterized by the death of larger or smaller portions of the tissues of inner (flat) face of the cotyledons, sometimes involving the plumule, and arising from certain unfavourable soil conditions which are not yet clearly understood. Tests at Harpenden indicated that the effect of the disease on the percentage germination of affected seeds is practically negligible, except in rare cases when the lesions are particularly large. The fact, however, that seedlings grown from marsh-spotted seeds are usually defective from the outset to a greater or lesser degree, may be of practical importance under unfavourable environmental conditions, not allowing of a rapid recovery of the plants from the initial handicap. The exact time at which the cotyledonary lesions begin to appear in the developing peas has not yet been determined with certainty, but there is some evidence that they are not present in the very young seed and become most pronounced during the later stages of ripening. The experiments do not indicate that the tendency to the development of marsh spot is hereditary.

LACEY (MARGARET S.). **Studies in bacteriosis. XXI. An investigation of marsh spots of Peas.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 621–640, 1 pl., 1934.

A detailed account is given of the author's investigation of the 'marsh

spot' disease of peas in England [see preceding abstract], which confirmed Helena de Bruijn's conclusion in Holland that the trouble is not caused either by fungi or bacteria [*R.A.M.*, xiii, p. 204]. Of 200 dried and 200 green pea seeds showing lesions of the disease on the cotyledons that were tested bacteriologically, only 40 per cent. of the former and 20 per cent. of the latter yielded growths of microorganisms, of which the two predominating species were a sporing bacillus of the *Bacillus subtilis* or *B. mesentericus* type and a minute yellow rod, probably *B.* [*Bacterium*] *herbicola aureum* [ibid., xii, p. 98], both of which were also frequently found on the outside of pea seeds and in a few cases in the centre of the cotyledons of healthy peas. Numerous attempts to reproduce the condition by inoculation of young pea seedlings and also of pods in various stages of development with cultures of all the organisms that were isolated from diseased material gave negative results.

Germination tests of marsh spot seeds showed that badly affected peas failed to develop; in less severe cases the primary shoot frequently died soon after germination, further growth being continued by the development of lateral shoots. In most seasons, after the seedling stage, no difference could be observed between plants grown from diseased or healthy seeds, and there was no evidence of any increase in the incidence of the trouble in the progeny from the diseased lot. While attempts to determine the effect of soil and excessive watering on the development of marsh spot in pot cultures gave entirely negative results, there was clear evidence that the conditions in pot culture are not suitable for the production of the trouble.

The paper terminates with a note by Dr. B. J. Grieve on the results of his microscopical investigation of the lesions caused by the disease in peas. The most noticeable point is the absence of any wound reaction around the lesion, the walls of the necrosed cells of which, however, showed the presence of suberin and insoluble pectic compounds.

LATHAM (D. H.). **Life history of a Cercospora leaf-spot fungus of Cowpea.** —*Mycologia*, xxvi, 6, pp. 516–527, 1 pl., 2 figs., 1934.

Since 1931 the writer has been engaged on a study of *Cercospora cruenta* [*R.A.M.*, xiv, p. 87], the agent of a leaf and stem spot of cowpea in North Carolina and other parts of the United States. Other hosts of the fungus represented in the Bureau of Plant Industry Herbarium include *Calopogonium* sp., *Dolichos sesquipedalis*, *D. sinensis*, *Phaseolus aureus*, *P. vulgaris*, *Vigna catjang*, and *V. unguiculata*.

The foliar lesions are reddish-brown, up to 1 cm. or more in diameter, becoming necrotic, sometimes coalescing, and turning grey to black on the under side with the formation of conidiophores and conidia. The hyphae are at first intercellular and form haustoria, but later on may become intracellular. They form a loosely interwoven, intercellular stroma in the substomatal cavities and elsewhere, from which arise erect, pale olive, loosely fasciculate, simple, forked, or subdenticulate conidiophores bearing acicular-obclavate, slightly curved, hyaline to olive conidia, tapering towards the apex and measuring 35 to 154 by 3·5 to 4·5 μ (average 62·5 by 3·7 μ), the average number of septa being five. These dimensions agree closely with those given by Saccardo for

C. cruenta. Late in September spermogonia develop within the subepidermal stromata; they measure 31 to 77 by 24 to 70 μ and contain hyaline, rod-shaped spermatia, 2 to 2·5 by 0·8 μ, all attempts at the germination of which failed. Perithecia were formed from old, subepidermal stromata from January onwards. They are scattered or with a tendency to aggregation, amphigenous (mostly hypophyllous), innate but erumpent at maturity, globose, black, ostiolate with an ill-defined papilla, and measure 52 to 70 by 63 to 87 μ; the fasciculate, cylindrical-clavate, aparaphysate asci measure 35 to 52 by 7 to 11 μ and contain eight unequally bi-cellular (the upper cell somewhat the larger), very slightly curved, hyaline ascospores, 11 to 19·2 by 3·5 μ (mostly 14 to 17·5 by 3·5 μ).

In pure culture on potato-dextrose agar conidia formed only during the first five days whether the cultures were derived from conidia or ascospores. Inoculations with ascosporal suspensions gave lesions bearing conidia identical with those produced by conidial suspensions. The perfect stage is a *Mycosphaerella* which is named *M. cruenta* n.sp., with English and Latin diagnoses.

Jikomskaya (Mme E. N.). Активность плесневых грибов в заболевании корнеедом ростков Сахарной Свеклы. [Activity of mould fungi in the etiology of the root disease of Sugar Beet seedlings.]—*Научные Записки по Сахарной Промышленности.* [*Sugar Industry Scient. Notes*], Kieff, xxxvii–xxxviii (10th year publ.) [Red Ser.], 11–12, pp. 199–206, 1934.

The results of the controlled experiments reported in this paper, carried out in 1930 in the neighbourhood of Kieff and at the Bielaya Tzerkoff [Ukraine] Agricultural Experiment Station, again showed that *Phoma betae* plays a very important part locally in causing root rot of sugar beet seedlings [*R.A.M.*, ix, p. 696]. It is particularly pathogenic during the earliest stages of development of the seedlings, many of which perish before the formation of the first pair of true leaves; it is believed that the fungus is also responsible for the death of a fairly large percentage of the germinating seed before emergence [cf. ibid., xiii, p. 742]. The experiments further confirmed the previously reported observation that the incidence of foot rot was markedly reduced in seedlings raised from seed inoculated with pure cultures of *Torula convoluta* as compared with the controls, even though the differences were not statistically significant in every case, and the cause of this reduction has yet to be elucidated. Inoculation of the seed clusters with dark moulds (e.g., *Alternaria tenuis* and *Cladosporium herbarum*) increased the incidence of foot rot from the end of April to the end of June; the disease caused by these moulds, however, was not as severe during the early stages as that caused by *P. betae*, and many of the plants attacked eventually recovered. Preliminary field observations showed, finally, that in volunteer beet seedlings grown from seed that had been produced by beets the roots of which were infected with *P. betae*, the percentage of foot root was more than twice that in controls, suggesting a direct relationship between infection of the roots and that of the seed produced by the diseased beets.

Fron (G.). **Observations sur l'influence de la pluviosité sur le développement de la maladie du cœur de la Betterave.** [Observations on the influence of precipitation on the development of Beetroot heart rot.]—*Comptes rendus Acad. d'Agric. de France*, xx, 27, pp. 883–888, 1934.

Notwithstanding the abnormally low mean rainfall in France during the past three winters, culminating in the drought of 1934, the current beet yields in certain districts, e.g., the Soissonnais and the plain of Lieusaint, are stated to have been very satisfactory, whereas in others, notably the environs of Meaux and Étampes and in the north of the Department of Loiret, heart rot (associated with *Phoma* [*betae*: *Mycosphaerella*] *tabifica*) [*R.A.M.*, xii, p. 549; see also xiv, p. 141 and preceding abstract] has caused heavy losses. In the writer's opinion the presence or absence of this disease is dictated primarily by the water-holding capacity of the soil. The fertile alluvial soils of the above-mentioned plains still maintained adequate reserves of moisture at a depth of 1 to 1·6 m. at the end (in September) of the protracted drought. The poor yields, on the other hand, came from the so-called 'white soils', i.e., those that had become desiccated through the removal by successive erosions of the upper layer of mud, leaving a sandy, often calcareous surface.

Further confirmation of the influence of desiccation on the development of heart rot was obtained at a farm near Meaux. On one part of a field in which the beet crop was sown in April the disease occurred in a virulent form, while the other section remained healthy. The latter had borne peas in 1933, but on account of poor growth the stand was early removed and the soil worked for fallow; the diseased part had been under a very vigorously growing clover crop which had completely exhausted the moisture reserves.

Foëx (E.) & Burgevin (H.). **Observations sur la maladie du cœur de la Betterave.** [Observations on the heart rot of the Beetroot.]—*Comptes rendus Acad. d'Agric. de France*, xx, 29, pp. 978–982, 1934.

The summer and autumn of 1933 witnessed a very marked recrudescence of heart rot of beets, especially in the vicinity of Montargis, in Sologne, Brie, Seine-Inférieure, and Mayenne, while in the following year (also very dry) the phenomenon was even more pronounced [cf. preceding abstract]. In certain parts of Valois the losses in the sugar-beet stands are estimated at Fr. 1,500 per hect.

Nearly all the soils in the affected localities were found to be strongly alkaline (P_H 8 to 8·5), and in this connexion attention is drawn to the risk of over-liming where heart rot is to be feared. Good results in the control of the disease were obtained in one field by seed treatment with formol, a fact suggesting that *Phoma betae* plays a certain part, though no doubt a secondary one, in the causation of the disease. In two fields in the Loiret the therapeutic action of boric acid at 3 to 6 kg. per hect. was conclusively demonstrated; sodium borate at the rate of 10 kg. per hect. may also be used. A combination of seed and soil treatments on these lines gave excellent results.

Jagger (I. C.) & Chandler (N.). **Big vein, a disease of Lettuce.**—*Phytopath.*, xxiv, 11, pp. 1253–1256, 1 fig., 1934.

Along with lettuce plants showing the typical symptoms of brown blight [*R.A.M.*, v, p. 598; viii, p. 286] in California, some are occasionally found with conspicuous pale yellow, enlarged veins and general thickening and crinkling of the leaves. These symptoms are most pronounced in actively growing plants, becoming noticeable with the fifth or sixth leaf and tending to disappear towards maturity. The disorder, known as 'big vein', is usually most severe in winter lettuce, the heads being reduced to about half the normal size and of inferior quality and value. Since it was first observed in connexion with brown blight about 1922, 'big vein' has slowly increased and during the past few years lettuce cultivation over a limited area has had to be discontinued owing to the severity of the disease, which has recently been detected also in Arizona. So far, however, there is no question of any serious interference with the commercial production of the crop as a result of 'big vein', which appears to be largely confined to the heavier types of poorly drained soils. The disease is soil-borne and may be controlled by partial sterilization of the ground. There is some indication, though no direct evidence, that the agent of 'big vein' may be a virus similar to that responsible for wheat mosaic [ibid., v, p. 85]. Though bearing a general similarity to brown blight, it is considerably less virulent and does not spread so rapidly.

Kendrick (J. B.) & Schroeder (F. R.). **Inoculation tests with Verticillium wilt of Muskmelons.**—*Phytopath.*, xxiv, 11, pp. 1250–1252, 1934.

Verticillium albo-atrum caused a destructive wilt of Persian muskmelons in San Joaquin County, California, in 1932 [cf. *R.A.M.*, iv, pp. 323, 495]. The diseased plants showed a brown discoloration of the vascular tissues of the root, stem, and large lateral shoots; the crown leaves wilted just before harvest and shortly afterwards the whole plant collapsed. The fungus did not attack the Hale's Best and Honey Dew varieties in the same field, but in greenhouse inoculation tests both proved susceptible, as also did Casaba and (to a considerably lesser degree) Honey Ball.

Kadow (K. J.). **Seed transmission of Verticillium wilt of Eggplants and Tomatoes.**—*Phytopath.*, xxiv, 11, pp. 1265–1268, 1 fig., 1934.

Details are given of tests at the Illinois Agricultural Experiment Station to ascertain the possibility of wilt (*Verticillium albo-atrum* or *V. dahliae*) transmission in eggplant [*R.A.M.*, xiii, p. 350; xiv, p. 74] and tomato [ibid., x, p. 757 *et passim*] by means of the seed. Infection was found to be conveyed in this manner, internal infection being of considerably more importance than external and perhaps accounting for the apparent coexistence of the disease with eggplant cultivation in the State. Some indication was obtained that eggplant seeds may be freed from *Verticillium* infection by 20 minutes' immersion in hot water at 120° F., but the selection of clean seed is the most important control measure.

Watanabe (T.) & Takahashi (N.). **A new leaf-spot disease of Arctium lappa L. caused by Cercosporina lappae n.sp.**—*Bull. Utsunomiya Agric. Coll.*, i, 1, pp. 33–40, 1 pl., 1934. [Japanese, with English summary.]

A Latin diagnosis is given of *Cercosporina lappae* Wat. & Tak. n.sp., the agent of a leaf spot of *Arctium lappa* [cultivated in Japan as a root vegetable].

The brown to blackish-brown, sharply defined, angular lesions, 1 to 8 mm. in diameter, are sprinkled in the centre or near the margin with small, greyish-white points formed by the fructifications of the fungus; the subhyaline to hyaline hyphae are 2·5 to 4·4 μ in width and the amphigenous, caespitose, straight or subflexuose, 0- to 8-septate conidiophores, pale yellow at the apex and brown at the base, measure 27·5 to 242·5 by 2·5 μ; the humeriform conidial scars are prominent, and the hyaline, 1- to 19-septate, cylindrical or acicular-obclavate, straight or flexuose conidia measure 27·5 to 270 by 2·5 to 6·25 μ.

Inoculation experiments with conidia produced on apricot decoction agar and on naturally infected foliage gave positive results on *A. lappa* leaves after an incubation of seven to ten days. At Utsunomiya the disease reached a climax between the end of August and late September. Promising results were given by weekly applications of 0·8 per cent. Bordeaux mixture from a month after the emergence of the seedlings onwards.

Edible and poisonous fungi.—*Min. of Agric. and Fish. Bull.* 23, v+25 pp., 24 col. pl., 1934.

This well-produced and useful little book, issued by the Ministry of Agriculture to assist in the identification of some of the more common edible and poisonous fungi, is a revised version of one originally prepared by G. Massee in 1910, with the whole of the text and nomenclature brought up to date. Illustrated by 24 excellent coloured plates (notably 15 new ones from paintings by Miss E. M. Wakefield who is also responsible for the revision of the text), the book gives short popular descriptions of 15 edible and 9 poisonous varieties of fungi, of which 20 belong to the Agaricaceae, the others being *Craterellus cornucopioides*, *Lycoperdon giganteum*, *Boletus edulis*, and *Morchella esculenta*. There are brief notes on the preparation of the edible kinds for the table, and the type of locality and the season in which the fungi may be found are indicated. A glossary of the few technical terms used is appended.

Zeller (S. M.) & Togashi (K.). **The American and Japanese Matsutakes.**—*Mycologia*, xxvi, 6, pp. 544–558, 6 figs., 1934.

Japanese residents of the Pacific borders of Oregon and Washington have applied the same name, 'matsu-takes' (pine mushrooms) to an American species of *Armillaria* as is given to that occurring in Japan, both being extensively used by them. However, from the writers' investigations [the results of which are fully discussed and the biometrical data tabulated] it would appear that the differences between the two are sufficient to warrant specific separation. The Japanese species, *A. matsutake* Ito & Imai (*Bot. Mag.*, Tokyo, xxxix, p. 327, 1925) is predominantly associated in a mycorrhizal relationship with

Pinus densiflora, while the American species *A. ponderosa* (Peck) Sacc. is found at its best in connexion with *P. contorta*. *A. ponderosa* is paler (pinkish-buff or light ochraceous salmon) than *A. matsutake* (tawny, russet, or Mars brown), the surface of the latter, moreover, being fibrous and scaly in contrast to the smooth, subviscid texture of the former.

Börner (C.) & Schilder (F. A.). **Beiträge zur Züchtung reblaus- und mehltaufester Reben.** [Contributions to the breeding of *Phylloxera*- and mildew-immune Vines.]—*Mitt. Biol. Reichsanst. für Land- und Forstw.*, 49, 84 pp., 4 pl., 1934.

In the introductory section of this paper the first-named author defines and discusses the conditions to be observed in the German programme for vine breeding for combined immunity from *Phylloxera vastatrix* and downy mildew (*Plasmopara*) [*viticola*: *R.A.M.*, xii, p. 548] in stocks and hybrids, while the second part (by both authors) deals with the reaction to *Phylloxera vastatrix* of selected vines of the Naumburg collection.

Husfeld (B.) & Scherz (W.). **Neuaufbau der Rebenunterlagenzüchtung.** [Reorganization of Vine stock breeding.]—*Der Züchter*, vi, 11–12, pp. 280–288, 9 figs., 1934.

Discussing the requirements for vine stocks under German conditions, the writers emphasize the necessity of a sufficient degree of resistance, not only to *Phylloxera vastatrix* and *Plasmopara viticola* [see preceding abstract], but also to *Uncinula necator* and *Pseudopeziza tracheiphila*. In inoculation experiments at the Kaiser Wilhelm Plant Breeding Institute, Müncheberg, Mark Brandenburg, resistance or only slight susceptibility to *U. necator* was shown by (I) the following American vines and their hybrids: Riparia G (11 numbers), Colorado, Gloire de Montpellier, grand glabre, pubescens bleu, splendens, Trier, Solonis, Solonis Trier, Rupestris G (4 numbers), du Lot, St. Georg, Tiefenbach, Riparia × Rupestris G (4 numbers), and M.G. 101^{10}, 101^{16}, 101^{14}, 108^{16}, and 108–103. (II) American × European (F_1) crosses: Riparia × Gamay 604 Oberlin, Gamay × Riparia 702 Oberlin, 716 Oberlin, falsche Gamay × Riparia 714 Oberlin, Riesling × Riparia 57 and 194 G, Trollinger × Riparia G (6 numbers), Aramon × Riparia 143 B.M.G., Aramon × Rupestris 1 Ganzin, and Solonis × Gutedel G (3 numbers). More or less marked susceptibility, on the other hand, was shown by the following representatives of group (I): Riparia I G Engers, 1 G, 88 G, *Vitis labrusca*, Rupestris 9 HG., 186 G, Riparia × Rupestris G (6 numbers), Cordifolia × Rupestris 89 G, Rupestris × Cinerea × Riparia 239–6–20 M.G., and Rupestris × Cinerea de Grasset (Mill.). (II) Riparia × Gamay 605 Oberlin, Riparia × Trollinger 37 and 56 G, Trollinger × Riparia 26 G, Frühburgunder × Cordifolia × Rupestris 17 G. (III) All varieties of *V. vinifera* [cf. *R.A.M.*, viii, p. 700 *et passim*].

The experimental results obtained with *P. tracheiphila* will form the subject of a separate publication.

Labrousse (F.). **Quelques observations sur les maladies des plantes en 1933.** [Observations on plant diseases in 1933.]—*Rev. Path. vég.*, xxi, 2–3, pp. 3–8, 1934.

These notes on diseases of market-garden crops, beetroots, and

tobacco observed during 1933 in the vicinity of Paris [cf. *R.A.M.*, xiv, p. 77] contain, among others, the following items of phytopathological interest. The resistance to bean [*Phaseolus vulgaris*] grease spot (*Bacterium medicaginis* var. *phaseolicola*) shown by the Nain abundant variety in 1931 [ibid., xi, p. 344] was confirmed, while the Nain de Chenilly variety proved practically immune from mosaic. Peas affected by collar rot were found to yield *Aphanomyces euteiches* unaccompanied by *Thielaviopsis basicola* [cf. ibid., xiii, p. 76]; early sowings, even when severely affected, gave a normal crop.

Su (M. T.). **Report of the Mycologist, Burma, Mandalay, for the year ending the 31st March, 1934.**—*Rep. Dep. Agric. Burma, 1933–4*, pp. 25–33, 1934.

A stunting of rice observed at the College Farm in 1932 and 1933 was found to be due to adverse soil conditions which were ameliorated in the Agricultural Chemist's experiments [pp. 14–15] by applications of sulphur in the form of sulphuric acid, sulphates, or superphosphate.

Sorghum was extensively attacked by *Colletotrichum lineola* [*C. graminicolum*: *R.A.M.*, v. p. 656], infection by which appears to take place both from the soil and aerially. A similar leaf spot was caused by *Cercospora sorghi* [ibid., xii, p. 395]. Wheat and barley were both infected by *Helminthosporium sativum* [ibid., xiv, p. 80 and below, p. 299].

Practically complete control of mildew (*Oidium*) on betel [*Piper betle*] leaves [ibid., xiii, p. 682] was given by treatment with sulphur dust.

The bulk of mangosteen (*Garcinia mangostana*) decay in storage was found to be due to *Diplodia natalensis* [ibid., xiii, p. 78]. The same fungus was found in some 8 per cent. of the mango fruits kept over in storage from a trial shipment to England, but most of the damage (73 per cent.) was associated with a *Dothiorella* [cf. ibid., x, p. 340]. Both these fungi were found to enter the fruits through the stem end.

Alternaria circinans [*A. oleracea*: ibid., xiii, p. 21] caused severe damping-off and dark spotting of the leaves in cabbage and cauliflower seedlings at the College Farm.

A papaw disease, causing foliar crinkling and distortion and apparently of virus origin, was greatly in evidence in many parts of the country, reducing the yield in severe cases.

C. traversiana was observed, for the first time in Burma, on *Trigonella foenum-graecum*.

The edible straw mushroom (*Volvaria* sp.) was successfully cultivated [ibid., xiii, p. 420], pure culture spawn being prepared in the laboratory and used for inoculating the beds.

Forty-fourth Annual Report Washington Department of Agriculture for the fiscal year ended June 30, 1934.—*Bull. Wash. St. Agric. Exp. Sta.* 305, 78 pp., 1934.

In the section of this report dealing with agronomy (pp. 13–25) it is stated that in a study by E. F. Gaines and A. M. Schlehuber of the inheritance of resistance to two biotypes of wheat bunt [*Tilletia caries*] made on an F_3 family of White Odessa × Turkey-Florence winter wheat (White Odessa being very susceptible to form t–4 [*R.A.M.*, xii, p. 618]

bunt but resistant to that from Ridit wheat, while with Turkey-Florence the reverse obtains) the full reaction of the parents was not manifested in any of 117 F_3 families inoculated with Ft–4, but some of the F_3 segregates when inoculated with *T. caries* from Ridit showed transgressive segregation. In general, when the F_3 segregates were inoculated with a mixture of both forms, the susceptible types produced less smut and the resistant ones more than when they were inoculated with a pure culture of the biotypes concerned. Ft–4 causes dwarfing of the florets, often accompanied by empty glumes, in Turkey-Florence and Ridit.

Of 64 families from Ridit × Hybrid 128 and Oro × Hybrid 128 inoculated with a mixture of 20 bunt biotypes, 5 remained free from infection and 7 others showed under 1 per cent. The progeny of a cross of Turkey (Wash. 2546) with Turkey-Florence consisting of 50 rows produced 8 rows entirely free from bunted heads and many others with only a trace; Turkey × Albit gave 2 bunt-free rows in the F_3, Turkey × Hohenheimer 11, while 52 F_3 families of Turkey-Florence × Baart-Ridit also showed many practically immune segregates.

In some 400 varieties and hybrid selections from F_3, F_4, and older generations of spring wheat the same general results were obtained as with the winter varieties. Crosses of Federation and Ridit, Turkey-Florence and Baart-Ridit, Turkey-Florence and Marquis-Florence, Marquis-Florence and Federation, Baart-Ridit and Federation, and Hope and White Odessa all produced practically immune or highly resistant segregates, from which it is hoped that some commercially desirable spring variety may be produced that shall be immune from all 20 biotypes of bunt.

In the section dealing with plant pathology (pp. 47–51) it is stated that in further studies by F. D. Heald, E. F. Gaines, and C. S. Holton [ibid., xiii, p. 359] 11 physiologic forms of *T. caries* and 10 of *T. levis* [*T. foetens*] have now been recognized. A new dust, basic copper sulphate, gave a degree of bunt control equal to that given by copper carbonate or ceresan and did not injure the seed. Smutted plants were more liable than healthy ones to be killed by frost.

A survey of the amount of decay among apples in cold storage in the Wenatchee district by G. A. Newton and in the Yakima Valley by P. Allen showed that blue mould [*Penicillium expansum*: loc. cit.] was the chief cause of decay in both localities. Grey mould (*Botrytis cinerea*) was exceptionally prevalent in the Wenatchee district, where much rain fell during harvesting, but much less so in the Yakima area, where little or no rain fell until the fruit had been stored.

L. K. Jones ascertained that a few seedling potato strains, as well as the Katahdin variety [ibid., xiii, p. 591], showed marked resistance to natural infection by the veinbanding virus [ibid., xiii, p. 533; xiv, p. 246]. Further tests confirmed the view that tomato mosaic is not seed-borne [ibid., xii, p. 540].

The results of field tests by L. Campbell on the control of downy mildew of peas (*Peronospora pisi*) [*P. viciae*] with sulphur and copper fungicides were unsatisfactory. E. J. Anderson found in a detailed study of pea powdery mildew (*Erysiphe polygoni*) that the powdery mildews of garden peas, perennial peas, alsike clover [*Trifolium hybridum*], and

common knotweed [*Polygonum aviculare*] were morphologically similar; the conidia of the pea powdery mildew caused infection on perennial peas, but not on red clover [*T. pratense*], lucerne, sweet clover [*Melilotus alba*], or beans. Tests with perithecia collected during autumn indicated that the ascospores do not remain viable throughout the winter and possibly are not a source of infection in the spring.

In a plant disease survey by F. D. Heald, L. K. Jones, and G. A. Huber, a species of *Botrytis* was repeatedly isolated from blackberries affected with 'pink berry', a condition characterized by soft, reddish-pink drupelets on the ripened fruit. The sour cherry fruit disease known as 'pink cherry', characterized by uneven ripening and an internal necrosis, caused considerable damage in western Washington; it resembles 'buckskin' [ibid., x, pp. 323, 528] in many respects and is possibly a virus disease, but its transmissibility has not yet been demonstrated. Crinkle and, to a less extent, yellows [ibid., xiii, p. 313] are present in many strawberry plantings in western Washington.

Sagen (H. E.), Riker (A. J.), & Baldwin (I. L.). **Studies on certain physiological characters of Phytomonas tumefaciens, Phytomonas rhizogenes, and Bacillus radiobacter. Part I.**—*J. Bact.*, xxviii, 6, pp. 571–595, 4 graphs, 1934.

A comparison was made of certain physiological characters of *Phytomonas* [*Bacterium*] *tumefaciens*, *P.* [*Bact.*] *rhizogenes* (the agents of crown gall and hairy root, respectively), and *Bacillus radiobacter*, a soil saprophyte resembling the first-named in various respects [*R.A.M.*, x, p. 167; xi, p. 357; xiv, p. 148], with special reference to their nitrogen and carbon metabolism. Most of the strains employed in the studies were progenies of single cells. The nine crown gall cultures were obtained from raspberry [ibid., xiii, p. 786], two cultures of the hairy root organism were from walnut and three from apple, six of *B. radiobacter* were from the United States Department of Agriculture and four from local (Wisconsin) sources.

Organic and inorganic nitrogen-containing compounds were utilized by *Bact. tumefaciens* and *B. radiobacter*, whereas *Bact. rhizogenes* made little or no growth either on single or mixed amino acids or on inorganic nitrogen. Nitrates were reduced only to a very slight extent by *Bact. tumefaciens* but completely by *B. radiobacter* in three weeks when glucose, raffinose, glycerol, mannitol, arabitol, or calcium gluconate were used as sources of carbon. When the various sugars, glucosides, and alcohols were used as a source of carbon, *B. radiobacter* produced an alkaline reaction in all cases of satisfactory growth except with propyl alcohol, in the presence of which both it and *Bact. tumefaciens* developed well and shifted the reaction towards acidity. The utilization of ethyl alcohol was accompanied by an acid reaction in *Bact. tumefaciens* and by an alkaline one in *B. radiobacter*. The basic reaction resulting from the assimilation of the organic acid salts may have been partly due to the more or less complete utilization of the acid radical with the basic ions remaining. An acid reaction developed in most cases of carbohydrate utilization by *Bact. rhizogenes*, while under the same conditions little or no acid was formed by *Bact. tumefaciens*. The lowest oxidation-reduction potential was induced by *B. radiobacter*.

Hendrickson (A. A.), Baldwin (I. L.), & Riker (A. J.). **Studies on certain physiological characters of Phytomonas tumefaciens, Phytomonas rhizogenes and Bacillus radiobacter. Part II.**—*J. Bact.*, xxviii, 6, pp. 596–618, 1 diag., 1 graph, 1934.

In further studies on the physiology of *Phytomonas* [*Bacterium*] *tumefaciens*, *P.* [*Bact.*] *rhizogenes*, and *Bacillus radiobacter* [see preceding abstract], 55 cultures (12 parents and 43 single-cell progenies) were employed. The sources of *Bact. tumefaciens* were galls on black raspberry [*Rubus occidentalis*], almond, walnut, and incense cedar [*Libocedrus decurrens*], while the hairy root cultures were all from apple. Grown on a medium consisting of 5 gm. glucose, 0·1 gm. sodium selenite, 15 gm. agar, and 1,000 c.c. of 1 per cent. yeast-water, and incubated at 20° C. for four days, *Bact. rhizogenes* was suppressed, while the other two developed profusely with a distinct red coloration due to the presence of free selenium. At a concentration of 1 to 10,000, dahlia eosin retarded the growth of *Bact. tumefaciens* and *Bact. rhizogenes* on a yeast-water mannitol agar medium, Bismarck brown and thionin also suppressing the latter. A distinctive feature of *Bact. tumefaciens* was its capacity to absorb aniline blue (1 to 10,000) from certain nutrient media at any reaction between P_H 4·4 and 8, a capacity not shown by the other two. Some aberrant crown gall cultures, however, though apparently equally virulent on young tomato plants with the normal type, failed to absorb aniline blue, and it was not absorbed by cultures on potato-dextrose agar.

Isolations of all three organisms lowered the oxidation-reduction potentials of a ferric-ammonium citrate and a yeast-water mannitol-aniline blue medium in a similar manner.

Variations in the physiological and pathogenic reactions of the 55 cultures were not obtained by continuous cultivation in artificial media. By successive passage through young tomato plants, however, the physiological (but not the pathogenic) behaviour of *Bact. tumefaciens* was modified in the following respects: failure to produce a serum zone in milk and to absorb aniline blue, production of an alkaline reaction and consequent pink colour in a potassium nitrate-glycerol-phenol red medium, and formation of rough colonies [ibid., xiv, p. 154].

Judged by their pathogenicity reactions, a near relationship is indicated between *Bact. tumefaciens* and *Bact. rhizogenes*, whereas a classification by physiological characters would closely unite the crown gall organism and *B. radiobacter*, with the hairy root agent in a more remote degree of relationship.

Adam (D. B.) & Pugsley (A. T.). **'Smooth-rough' variation in Phytomonas medicaginis phaseolicola Burk.**—*Aust. J. exp. Biol. med. Sci.*, xii, 4, pp. 193–202, 1934.

Observations on Magnum Bonum bean (*Phaseolus vulgaris*) seeds at Melbourne showed that *Phytomonas* [*Bacterium*] *medicaginis* [var.] *phaseolicola* [*R.A.M.*, xiv, p. 72] may occur in at least two forms, smooth and rough [see preceding abstract], differing essentially in the same respects as the well-recognized S and R forms of the Gram-negative intestinal organisms. The R form gives a flocculent growth in broth and is relatively unstable in salt solutions (especially after heating at 100° C.)

and in undiluted bean 'sap'; it is also agglutinated in 0·2 per cent. trypaflavin. The S form gives a uniform turbidity in broth, is stable in salt solutions, both before and after heating, and in bean sap, and is not agglutinated in 0·2 per cent. trypaflavin. It was demonstrated by means of the agglutination test that the change from S to R involves a corresponding modification of the heat-stable or somatic antigen. The S strain was sensitive and the R non-sensitive to a bacteriophage obtained from diseased bean seeds. R was further less virulent than S, while a third variant, RV, was shown to be non-pathogenic to beans.

Verona (O.). **Recherche d'un principe lysant dans les terres cultivées.** [A search for a lytic principle in cultivated soils.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vi, 11, pp. 427–430, 1934.

After pointing out that numerous attempts have been made to isolate a bacteriophage [*R.A.M.*, xiii, p. 748] from the water of sewers, rivers, and lakes as well as from sea-water, the author states that the first record of the isolation of a bacteriophage from soil was made in 1920 by Dumas who in manured ground found a bacteriophage active towards *Bacterium* [*Bacillus*] *dysenteriae* and *Bact.* [*B.*] *coli*. The evidence obtained in the author's experiments with different soils and bacteria indicated that a bacteriophage is present in cultivated soil only when there is association between it and a bacterium; this occurs only with pathogenic organisms [cf. ibid., xiii, p. 697] and *Bact. radicicola*.

Rouzinoff (P. G.). Исследование вредоносности некоторых болезней хлебных злаков в полевых условиях. [Investigation of the degree of injury caused by certain cereal diseases in the field.]—*Bull. Pl. Prot. Leningr.*, Ser. II (*Phytopath.*), *1934*, 4, pp. 5–30, 1934. [English summary.]

From a cursory review and discussion of the methods usually employed for estimating the injury caused by parasitic diseases to cultivated crops the author concludes that the only method capable of giving reliable results under field conditions is that of a direct comparison of the yields of healthy and of diseased plants in the same field. His preliminary experiments in the droughty steppe region of south-western Russia and in moist regions of the Russian Far East indicated the existence of a distinct direct relationship between the height of the culms of cultivated cereals and their yield in grain, on the one hand, and the intensity of the attack on them by certain diseases, on the other, the relationship in this case being either direct or inverse, according to the disease. For this reason he suggests a method consisting in collecting separately randomized samples of healthy, and of slightly, moderately, and heavily infected plants from the whole field, each class being then subdivided into five to seven sections according to the length of the culms, and the reduction in yield of each subsection determined in percentages of the yield of the longest healthy culms. The actual working formulae for obtaining the relative and total figures of the losses are indicated. In determining rust injury, however, the length of the culms should be measured only from the basal node to the node bearing the topmost leaf, since observations indicated that the portion above this (including the ear) is considerably more stunted by rust

attack than the rest of the plant, and since no correlation could be determined in rusted plants between the length of the culm to this point and the length of the apical portion.

This method is amply illustrated by concrete examples of the damage done in 1932 and 1933 by four cereal rusts, chiefly in the Far East. The greatest injury was caused by the linear [yellow] wheat rust [*Puccinia glumarum*] which attacked particularly severely hard wheats which are usually considered to be resistant. This rust, as well as brown rust [*P. triticina*], affected shorter culms more heavily than the longer ones, while in 1933 the taller culms of oats appeared to be more heavily infected by crown rust [*P. lolii*] than the shorter, presumably owing to the peculiar climatic conditions of that year.

The investigation was also extended to some other cereal diseases usually considered to be of minor importance, such as, for instance, leaf spots caused by *Helminthosporium* and *Septoria* spp., the results indicating that the damage done by them is more important than commonly assumed. In general, it is stated that the economic effect of a complex of diseases affecting a crop cannot be determined by simply adding up the yield reduction attributable to each disease individually.

Toumarinson (C. S.). К физиологическому обоснованию шкал учета вредоносности ржавчины. [On the physiological basis of scales for estimating the injuriousness of rust.]—*Bull. Pl. Prot. Leningr.*, Ser. II (*Phytopath.*), *1934*, 6, pp. 35–56, 1 diag., 1934. [English summary.]

After pointing out that the scales hitherto used for the estimation of the intensity of rust attack do not reflect the internal processes that take place in the diseased plant, the author states that his observations of the latter in oat plants artificially infected with crown rust (*Puccinia coronifera*) [*P. lolii*: see preceding abstract] indicated that in the case of cereal rusts a scale based on the percentage of leaf area covered by the pustules of the rust may be fairly accepted for the estimation of the injury, on condition that the degree of infection should be determined in connexion with the stage of development of the plant at the moment of inoculation, the development stage of the fungus, and the meteorological and other environmental conditions which prevailed during the experiment. A still greater degree of accuracy may be attained by including the area of the spots around the pustules, as the work showed that the injury done to the host rapidly increases with increase in the area of these spots.

Tranzschel (V.). Промежуточные хозяева ржавчины хлебов и их распространение в СССР. [Alternate hosts of cereal rusts and their distribution in U.S.S.R.]—*Bull. Pl. Prot. Leningr.*, Ser. II (*Phytopath.*), *1934*, 5, pp. 4–40, 1934. [German summary.]

In this paper the author gives a summarized account of the work done up to date both abroad and in Russia in the search for alternate hosts of the rusts of cultivated cereals. He gives an exhaustive descriptive list of the species of barberry which have so far been found to harbour *Puccinia graminis* in the U.S.S.R., with their geographical distribution. In a comprehensive review of experimental work, mainly abroad, on

the transmissibility of crown rust (*P. coronifera avenae*) [*P. lolii*] from oats to other Gramineae and vice versa, he concludes that the form specialized on oats can only attack other species besides oats and wild oat grasses under favourable experimental conditions. An annotated list is given of the species of *Rhamnus* which occur in Russia, indicating those on which rust aecidia have been found, though their pathogenicity to oats has not been tested from many species; *R. dahurica* and *R. pallasii*, which are very widespread throughout the U.S.S.R., require further testing.

A detailed account is given of Main's and Jackson's experiments in the United States [*R.A.M.*, xii, p. 499] on the aecidial stage of brown wheat rust [*P. triticina*] on species of *Thalictrum*, and of Eremeyeva's experiments in Russia in 1926 [cf. ibid., v, p.25] in successfully infecting with teleutosposes from wheat *T. exaltatum*, *T. glaucum*, *T. nutans*. *T. ruthenicum*, *T. tuberosum*, *T. corynellum*, *T. elatum*, *T. adiantifolium*, and *T. minus*, and back inoculating from the aecidia to *Triticum vulgare*, *T. durum*, *T. spelta*, and rye, but not to barley. Eremeyeva's *Thalictrum* plants, however, were grown from seed imported from Turin and Kew, and since there is a distinct possibility of hybridization of the species when cultivated in botanic gardens, this may explain certain discrepancies between her results and those obtained in America, where *T. minus* was found not to be susceptible. A complete list is given of the species of *Thalictrum* occurring in Russia, many of which have not yet been tested for their susceptibility to *P. triticina*, as well as a summary of experiments to determine the transmissibility of the rust to other Gramineae, in which the author readily succeeded in infecting *Aegilops crassa* and *A. cylindrica* with uredospores from wheat.

Among the Russian species of *Anchusa*, the alternate host of brown rust of rye (*P. dispersa*) [*P. secalina*], an annotated list of which is given, aecidia have been found on *A. officinalis*, *A. gmelini* growing mixed with the wild grass *Secale fragile*, and *A. ochroleuca*. Aecidia were also found on *A. myosotidiflora*, but are not believed to belong to this rust. In dealing with the Russian species of *Ornithogalum* (which are arranged according to a new unpublished revision of the genus by H. Krasheninnikoff), the alternate host of brown barley rust (*P. anomala*), the author states that in 1926 in the Crimea he successfully inoculated *O. fimbriatum* and *O. narbonense* with teleutospores from rusted barley straw. A brief reference is also made to his success in 1905 in infecting *Oxalis corniculata* with teleutospores of maize rust (*P. maydis*) and returning the rust from *O. corniculata* to maize. Aecidia of the rust have apparently not yet been observed in nature on species of *Oxalis* in the U.S.S.R., where two, *O. stricta* and *O. corniculata*, are widely distributed.

In the last section the author discusses at some length the reasons which lead him to believe that the aecidia of *Aecidium valerianellae* Biv. which are abundantly found on species of *Valerianella* in the Crimea and Caucasus belong to *P. glumarum*.

Sibilia (C.). **Relazione sulle esperienze di lotta diretta contro le ruggini del Grano.** [An account of experiments on the direct control of Wheat rusts.]—*Boll. Staz. Pat. veg., Roma*, N.S., xiv, 3, pp. 327–333, 2 figs., 1934.

In an experiment carried out near Alessandria, northern Italy, in

1934, a field of Damiano Chiesa and another of Edda wheat received, respectively, eight and four applications (made during May and June, at the rate of 40 kg. per hect.) of natural sulphur from the Romagna [cf. *R.A.M.*, viii, p. 701], two other fields of the same varieties being left untreated as controls. At the time of the first application the plants showed some infection by *Puccinia triticina* and *P. glumarum* and a trace of *P. graminis*. After harvesting, the treated Damiano Chiesa wheat showed an increase in yield of 1·6 quintals per hect. and an increase in specific weight of 2·2 kg. per hectol. over the control, the net profit given by the dusting (all costs deducted) on this variety amounting to 20 lire per hect., which, rust infection being extremely slight, is considered to be a satisfactory result. The treated Edda wheat showed an increased specific weight of 700 gm. per hectol., as compared with the control.

Anderson (J. A.). **Studies on the nature of rust resistance in Wheat. VI. Effect of hydrogen ion concentration, phenolic compounds, and host extracts on the germination of urediniospores of Puccinia graminis tritici, form 21.**—*Canad. J. Res.*, xi, 6, pp. 667–686, 2 graphs, 1 diag., 1934.

After a brief review of the work hitherto done in the investigation of the nature of resistance of wheat to black rust (*Puccinia graminis tritici*), with particular reference to Ezekiel's study of the effect of very dilute host extracts on the growth of the germ-tubes of the uredospores in hanging drops [*R.A.M.*, x, p. 712], the author gives details of experiments in which he tested the inhibitory action of more concentrated solutions (15, 10, 5, and 2·5 per cent.) of extracts from Vernal, Khapli, Marquis, and Little Club wheats (the first two of which are resistant and the others susceptible) both on the growth of the germ-tubes and on the germination of the uredospores of form 21 of the rust. The results [which are shown in tables and are analysed by statistical methods] indicated that the relative inhibitory properties of extracts taken from day to day varied, presumably owing to differences in the environmental conditions under which the plants were grown; this view was supported by the fluctuations from series to series in the relative quantities of total solids in the expressed juice of the different varieties, and by similar variations in hydrogen-ion concentration, in regard to which preliminary experiments showed that maximum uredosporal germination in this form of the rust occurred between P_H 5·8 and 6·5, with indications that the optimum lies in the neighbourhood of 6·2. Variations in total solids, however, did not consistently affect the results of the tests, suggesting that the quantities of the various compounds (including the inhibitory ones) in the expressed juice varied independently, though it is also possible that physical properties not reflected by an estimate of total solids are important factors. In no case was the extract from a variety shown to have a significantly greater inhibitory effect than that of another variety at one concentration and a significantly lesser effect at another.

Both tests showed that differences exist between the average inhibitory effects of the extracts of certain of the wheat varieties, the order of increasing inhibitory effect both on germination and on growth being

Vernal, Marquis, Khapli, and Little Club; the results as a whole failed to show any relation between the inhibitory effects of the extracts and rust resistance of the variety.

In a collateral series of experiments the germination of the uredospores was studied in buffered and unbuffered solutions of 23 pure phenolic compounds. Among the results obtained it was noted that a 200 p.p.m. phenol solution, which had a comparatively slight effect on germination, considerably stimulated the growth of the germ-tubes, but that both germination and growth were increasingly inhibited at increasing concentrations, until at 600 p.p.m. no germination or growth occurred. The results of this investigation, taken in conjunction with those of Ezekiel's work, suggest that host extracts behave similarly, i.e., that although they reduce growth of the fungus at high concentrations, they stimulate it at very low ones.

Straib (W.). **Untersuchungen zur Genetik der Gelbrostresistenz des Weizens.** [Investigations on the genetics of yellow rust resistance in Wheat.]—*Phytopath. Z.*, vii, 5, pp. 427–477, 1934.

In the writer's studies on the mode of inheritance of resistance to 18 physiologic forms of yellow rust (*Puccinia glumarum*), including all those prevalent in Germany [*R.A.M.*, xiii, pp. 756–7], absolute immunity was found, in every cross in which it occurred, to constitute a dominant character dependent on a single factor, irrespective of the varietal reaction of the non-immune parent. The type *i* reaction, therefore, must be sharply differentiated from all other types of infection, in contradistinction to the results obtained by Stakman and Levine and other American workers with various rusts, in which there is no well-defined line of demarcation between absolute immunity, relative immunity, and pronounced resistance [cf. ibid., ii, p. 158 *et passim*]. As regards previous studies on the inheritance of reaction to *P. glumarum* [cf. ibid., xii, p. 208; xiii, p. 619], it is pointed out that the conception of immunity was interpreted by the workers in question as relative and not absolute, hence their conclusions that the character is inherited in a dominant form but not consistently by monofactorial segregation.

Relative resistance may be transmitted by one or more factors according to the varieties used as parents and the physiologic form of *P. glumarum* employed as inoculum, and may be dominant, intermediate, or recessive to high susceptibility. From the genetic standpoint, it is just as feasible to work with varying grades of susceptibility as with resistance and susceptibility. In this connexion it is important to note that the dominance ratios vary even where the parent varieties are quite consistent in their reaction to the different physiologic forms of *P. glumarum*. In a given cross, the reaction towards one group of physiologic forms may be inherited quite independently of that towards another. Transgression in the direction of enhanced susceptibility was demonstrated in the cross between Rümkers Sommerdickkopf and Heines Kolben.

Discussing the bearing of these results on practical breeding for resistance to yellow rust, the evidence obtained that the physiologic forms may be arranged in groups which react similarly to infection, and

evidently all contain similar factors for resistance and susceptibility, introduces a considerable simplification by greatly reducing the number of individual forms of the rust to be used in varietal reaction tests. Under greenhouse conditions it is evidently possible to select lines of 42-chromosome wheats possessing resistance to, or immunity from, all the known physiologic forms of *P. glumarum*.

SHEN (T. H.). **The inheritance of resistance to flag smut (Urocystis tritici Koern.) in ten Wheat crosses.**—*Bull. Nanking Coll. Agric. For.* 17 (N.S.), 16 pp., 1934.

In a study of the resistance of wheat to flag smut (*Urocystis tritici*) [*R.A.M.*, xiii, p. 752] at Nanking ten crosses were made between (1) nearly immune varieties, (2) nearly immune and very susceptible strains, (3) nearly immune and susceptible strains, and (4) resistant and susceptible strains.

The F_2 plants from the cross Pathology Head 4592 (nearly immune) × Pathology Head 1102 (very susceptible) segregated into 195 smut-free and 19 smut-susceptible plants. The susceptible plants in the F_2 bred true in the F_3 progenies, giving from 4 to 30 per cent. infection, while the smut-free ones showed further segregation. One of the former families showed greater susceptibility than the susceptible parent of the cross. From the smut-free families in the F_3, 1507 plants were selected for a further test and most of the F_4 families were found to be smut-free. According to the results in the F_4 three of the F_3 progenies were as resistant as the nearly immune parent.

With the cross Nanking 26 (fairly susceptible) × Nabawa (nearly immune) there were in proportion more smutted plants in the F_2 and smutted families in the F_3 than in the cross described above, but the percentage of smut in the F_3 families was lower indicating that fewer genes were involved in this cross than in Pathology Head 4592 × 1102. No progenies in the F_4 showed any smut.

Out of 394 plants in the F_2 of Pathology Head 4592 × Nabawa two were partially smutted, indicating that the parents have different genotypes.

With Pathology Head 4084 (nearly immune) × Reward (susceptible) there was only 1 smutted among 132 F_2 plants, while in the F_3 families only 7 out of 24 showed slight smut, indicating that Reward contributed only a few minor susceptible genes and that the other parent had all dominantly resistant genes.

With Pathology Head 4666 (nearly immune) × Kiangsi Early (susceptible) there were 26 smutted out of 432 F_2 plants. Twenty-two out of 40 F_3 families were smutted but showed a wide range in the percentage of smut, which in 11 families was much higher than in the susceptible parent. This cross indicated transgressive inheritance. The nearly immune parent evidently contains susceptible as well as resistant genes.

It is concluded that the major genes for resistance of wheat to flag smut are not numerous, the results obtained with three of the crosses indicating the existence of only three pairs of genes.

The evidence obtained showed that there was no correlation between flag-smut resistance and hairiness of the glume or the presence or absence of awns.

Biraghi (A.). **Ricerche citologiche sulla germinazione delle clamidospore di 'Urocystis tritici' Koern.** [Cytological researches on chlamydospore germination in *Urocystis tritici* Koern.]—*R. C. Accad. Lincei*, xx, 9, pp. 343–346, 1934.

The writer has carried out a study on chlamydospore germination in *Urocystis tritici*, the cause of flag smut of wheat [see preceding abstract], with the object of amplifying and elucidating certain aspects of Noble's work on the same fungus [*R.A.M.*, xiii, p. 431]. The process was found to follow the same lines as those described by Kniep and Rawitscher, respectively, for *U. anemones* and *U. violae* [ibid., i, p. 451].

Gassner (G.) & Kirchhoff (H.). **Zur Frage der Beeinflussung des Flugbrandbefalls durch Umweltfaktoren und chemische Beizmittel.** [On the question of the influence of environmental factors and chemical disinfectants on the incidence of loose smut.]—*Phytopath. Z.*, vii, 5, pp. 487–503, 1934.

The incidence of both wheat and barley loose smuts [*Ustilago tritici* and *U. nuda*] was found to be somewhat higher in light clay-sand than in heavy soils. The use of a complete fertilizer tended to reduce the amount of infection as compared with that in the plots in which any one of the main constituents was omitted. Low germination temperatures also caused a decline in the incidence of the smuts. The addition of a chemical disinfectant, e.g., germisan, to the steeping water used in the hot water treatment of the two diseases is liable to counteract the beneficial action of the latter on the seed-grain by the introduction of osmotically active substances which reduce the intake of water.

Kotte (W.). **Die Federbuschsporen-Krankheit des Getreides.** [The plumed spore disease of cereals.]—*Nachr. SchädlBekämpf., Leverkusen*, ix, 4, pp. 170–174, 2 figs., 1934.

Since the war considerable damage has been caused to the wheat crops in western Germany by the plumed spore disease (*Dilophospora alopercuri*) [*R.A.M.*, xiii, p. 624], which also attacks rye and oats. In the Rhine Province losses up to 30 per cent. of the wheat stands have been reported. Inoculation experiments are stated to have proved conclusively that there is no necessary connexion between the plumed spore disease and eelworms (*Tylenchus* [*Anguillulina*] *tritici*), their frequent association merely denoting their common response to defective sanitation in the field. The fungus is seed-borne and capable of attacking the germinating seed-grain without external aid, so that seed-grain treatment should certainly be practised for the control of the disease.

Nisikado (Y.), Matsumoto (H.), & Yamauti (K.). **Physiological specialization of Gibberella saubinetii (Mont.) Sacc., in its pathogenicity to Wheat seedlings.**—*Ann. phytopath. Soc. Japan*, iv, 1–2, pp. 1–12, 1934. [Japanese, with English summary.]

Inoculation experiments with conidial suspensions of 124 strains of *Gibberella saubinetii*, which causes very serious head and seedling blights of wheat [*R.A.M.*, xiii, p. 263], barley, and other cereals in

Japan, showed that a wide range of pathogenicity on wheat seed-grain exists in strains from wheat and barley in different parts of the country. For instance, with some strains the differences between the mean percentages [shown in tables] of healthy seedlings in the inoculated and control lots were 20 to 50 times as great as the probable errors, indicating a high degree of pathogenicity, whereas in others the corresponding figures were only 3 to 5 times, probably denoting non-pathogenicity. In addition to these extremes there were a number of strains of an intermediate order of virulence.

Agronomoff (E. A.), Dounin (M. S.), Bundel (A. A.), Goryatchikh (A. N.), & Koreneff (N. A.). Биохимия и микробиология фузариозного зерна Пшеницы при его хранении. [Biochemistry and microbiology of stored Wheat grain infected by *Fusarium*.]—ii+96 pp., 17 figs., 19 graphs, Снабтехиздат. [Food Supplies Tech. Publ. Office], Leningrad, 1934.

This little book is divided into three sections. The first (by Dounin and Goryatchikh) deals with various methods usually employed for the qualitative analysis of wheat samples to determine the degree of contamination by pathogenic and saprophytic micro-organisms, with particular reference to species of *Fusarium*, some of which are known to develop in the affected grain substances toxic to man and to animals [*R.A.M.*, v, p. 543], besides considerably impairing the viability of the seed. Attention is drawn to the almost complete absence, both in phytopathological literature and in the local or international rules concerning seed testing, of definite and uniform instructions for the examination of cereal grain, and a full account is accordingly given of the authors' detailed macroscopical and cultural investigation of wheat and rye samples from the 1932 crop in North Caucasus. The results demonstrated that the degree of contamination by *Fusarium* spp. cannot be determined macroscopically. Most of the grain examined was infected with a very complex bacterial and fungal flora, among which species of *Fusarium* occupied an insignificant place, while bacteria, apparently *Bacterium atrofaciens*, *Bact. translucens* var. *undulosum*, and *Micrococcus tritici* [ibid., iv, p. 530], were widely represented. The germination tests were prolonged up to 11 or 12 days, a time which was found to be necessary to obtain a complete determination of all the micro-organisms present, by the use of a special type of germinator in which each grain was isolated from the others. In a further modification the atmosphere can be kept saturated with moisture, thus ensuring a perfect control of bacterial development while promoting fungal growth, the optimum temperature for which was found to lie between 20° and 25° C. Among the species of *Fusarium* identified, the most frequent were *F. moniliforme* [*Gibberella moniliformis*] (presumably because of its widespread occurrence on maize and certain other crops in North Caucasus), *F. culmorum*, *F. nivale* var. *majus* [*Calonectria graminicola* var. *neglecta*], and *F. solani* var. *minus*.

In the second section (by Agronomoff, Koreneff, Bundel, and Goryatchikh) the results are given of experiments to determine the behaviour of healthy and infected wheat grain under various conditions of storage. Naturally air-dry or artificially dried wheat kept in a dry

atmosphere did not give a growth of *Fusarium* even when these fungi were known to be present, and they eventually died out. In damp grain and under moist conditions a marked development of *Fusarium* was noted at first, associated with a rise in the P_H value of the substratum, but later bacteria took the upper hand, terminating in the almost complete elimination of the fungi. Heating the infected grain at 60° and 80° C. for one hour before storing did not kill the mycelium but markedly reduced its vigour; heating at 100° for the same length of time entirely suppressed the *Fusarium* spp. but also destroyed the germinability of the grain and promoted the growth of other mould fungi (particularly *Penicillium* and *Aspergillus*) even in wheat stored under comparatively dry conditions. The viability of the bacteria was but slightly reduced by heating at 100°. Biochemical investigation showed that the enzymic activity of the wheat grain was increased in samples exhibiting mixed infection, and the changes brought about in the chemical constitution of the grain by the activity of the bacteria and fungi are described in some detail; it was found that damp wheat containing a mixed infection kept under moist conditions loses considerably in nutritive properties.

The third section (by Dounin) is an attempt to formulate a set of instructions, based on the work described above, for making a macroscopical and biological analysis of cereal grains both for home needs and for export requirements.

Greaney (F. J.) & Machacek (J. E.). **Studies on the control of root rot diseases of cereals caused by Fusarium culmorum (W. G. Sm.) Sacc. and Helminthosporium sativum P., K., and B. I. Field methods with root rot diseases.**—*Sci. Agric.*, xv, 4, pp. 228–240, 1934. [French summary.]

In the authors' three years' field tests [the results of which are tabulated and discussed] conducted at Winnipeg to devise an effective method of artificially inducing for experimental purposes epidemic attacks of the cereal root rots caused by *Fusarium culmorum* and *Helminthosporium sativum* [*R.A.M.*, xiii, p. 362], the amount of disease developing in the plots was expressed as a 'disease rating', the value of which represented the percentage number of plants affected and the degree of infection. Each year the disease rating in a series of plots of Marquis wheat was varied by adopting different methods of introducing the fungi into the soil, and in the final analysis of all the results the ratings for each plot were correlated with the yields, this relationship being expressed as a 'correlation coefficient'. The values given by these coefficients were highly significant, the disease rating accurately measuring the amount of infection produced. Attack by either fungus markedly reduced the yield.

The best method of inducing a severe attack by *F. culmorum* consisted in adding a spore suspension to the seed-grain before sowing, while the most satisfactory results with *H. sativum* were obtained by a combination of this method with the application of oat hull inoculum to the soil. None of the methods tested gave a really epidemic attack by *H. sativum*.

The results obtained are considered as clearly demonstrating the value and importance of plot arrangement and statistical methods in the interpretation of field experiments on cereal root rots.

Böning (K.) & Wallner (F.). **Keimlingsbefall und sonstige Erkrankungen durch Helminthosporium sativum P. K. und B. an Gerste in Bayern.** [Seedling infection and other pathological conditions of Barley in Bavaria due to *Helminthosporium sativum* P., K., and B.]—*Prakt. Bl. Pflanzenb.*, xii, 9, pp. 257–279, 5 figs., 3 graphs, 1934.

The occurrence of *Helminthosporium sativum* on field barley in Germany [*R.A.M.*, xiv, p. 159] was first detected by the writers in Upper Franconia in 1931; subsequently the fungus, which under local conditions appears chiefly to attack seedlings, was found near Munich and elsewhere, as well as in a number of seed samples. The symptoms of the seedling blight are described in relation to the life-history of the pathogen and its mode of infection (through the seed-grain or from the soil) and control, while the results of morphological and cultural studies are tabulated and discussed in some detail. Repeated attempts to obtain the development of perithecia in pure cultures of the fungus failed. Adequate though not complete control of the seedling blight was obtained by seed-grain disinfection with various brands of the standard fungicides, germisan, ceresan, uspulun, and fusariol, as officially recommended against stripe disease (*H. gramineum*) [ibid., xiv, p. 20].

Appel (O.). **Streifenkrankheit und Blattfleckenkrankheit der Gerste.** [Stripe disease and leaf spot disease of Barley.]—*Dtsch. landw. Pr.*, lxi, 51, p. 627, 1 col. pl., 1934.

This is a semi-popular note on the symptoms of stripe disease of barley, the life-history of the causal organism (*Pleospora* [*Pyrenophora*] *trichostoma*), usually found in its conidial form (*Helminthosporium gramineum*), and its control by treatment of the seed-grain with certain officially recommended fungicides [see preceding abstract]. The leaf spot [net blotch] due to *H. teres* [*R.A.M.*, xiv, p. 159] is stated to be generally of slighter importance and less widespread in Germany than the foregoing; it may be combated where necessary by the same disinfectants.

Nisikôri (T.). **Parasitic relation of Puccinia triticina Eriks. to Barley. I.**—*Ann. phytopath. Soc. Japan*, iv, 1–2, pp. 13–20, 3 figs., 1934. [Japanese, with English summary.]

Seedlings of 13 barley varieties inoculated at the Phytopathological Laboratory of Tokyo University with uredospores of *Puccinia triticina* from wheat proved to be susceptible in the summer and autumn [*R.A.M.*, xii, p. 274]. The uredosori on barley seedlings are fewer and smaller than those on wheat, but there was no diminution of virulence in the uredospores produced on the former host, which were able to reinfect both wheat and barley. In winter inoculations barley seedlings showed a high degree of resistance to *P. triticina*; the germ-tubes enter the leaves freely through the stomata, but some of the infecting hyphae cease growth, producing only the rudiments of haustoria, and soon die. The cell walls of the tissues in contact with these dead hyphae are swollen and stain vividly with safranin. A few haustoria may develop, but sooner or later they collapse and die, together with the invaded cells.

Kokin (A. J.). & Toumarinson (C. S.). Физиологическое обоснование вредоносности ржавчины Овса **Puccinia coronifera Kleb.** [The physiological basis of the injuriousness of the Oat rust *Puccinia coronifera* Kleb.]—*Bull. Pl. Prot. Leningr.*, Ser. II (*Phytopath.*), *1934*, 6, pp. 5–34, 13 graphs, 1934. [English summary.]

The results of the experiments reported at length in this paper showed that in oat (Golden Rain) plants artificially infected with crown rust (*Puccinia coronifera*) [*P. lolii*] in the greenhouse the energy of CO_2 assimilation was, as a rule, lower than in the controls, the decrease in the energy increasing with the intensity of infection with the rust and being especially marked at the time when the fungus passes into its teleutospore stage. Intensity of respiration, on the other hand, increased in the slightly rusted and, to a somewhat lesser degree, in the moderately rusted plants; in heavily attacked plants, however, it was generally lower than in the controls. It was also shown that the amount of soluble carbohydrates, proteids, and chlorophyll in the oat leaves decreased with the intensity of the rust, and that the destruction of the chlorophyll-bearing parenchyma is one of the chief causes of the untimely death of the affected plants. In heavily infected plants the weight of the grain produced was reduced by 28·63 per cent. as compared with the controls, and the content of the grain in proteids by 3·45 per cent.

Gassner (G.) & Kirchhoff (H.). **Einige Versuche zum Nachweis biologischer Rassen innerhalb des Roggenbraunrostes, Puccinia dispersa Erikss. und Henn.** [Some experiments for the demonstration of biologic races within the brown rust of Rye, *Puccinia dispersa* Erikss. and Henn.]—*Phytopath. Z.*, vii, 5, pp. 479–486, 1934.

The behaviour of ten monospore lines of brown rust of rye (*Puccinia dispersa*) [*P. secalina*: *R.A.M.*, xiii, pp. 430, 752] from various parts of Germany was studied on three ryes (Petkus winter, Jägers North German Champagne, and Schrickers Gottlieb winter). Indications of the existence of physiologic specialization within the rust were afforded by the differential reaction of the host plants, especially in the extent to which teleutospores were formed, but owing to the difficulty of obtaining genotypically pure rye varieties it was not possible to follow up this line of work. Advantage was, therefore, taken of the fact that *P. secalina* can cause uredo pustules to develop on certain wheat varieties and on others causes a characteristic necrosis or chlorosis. Generalized necrosis developed in *Triticum durum* var. *melanopus* as a reaction to all the ten lines of *P. secalina* used in the tests. Isolated uredosori were formed on *T. vulgare* var. *lutescens* (Litowska and Aleph), *T. compactum* var. *wernerianum*, and *T. dicoccum* var. *atratum*, inoculations with the spores of which on rye resulted in the typical symptoms of *P. secalina*. In most of the wheat varieties, however, no uredospores were formed. Chlorotic and necrotic lesions developed on *T. spelta* var. *coeruleum* as a sequel to infection by all the lines of the rust. Red Chanson Fall Goldcoin (*T. vulgare* var. *milturum*), Winter Banat (var. *erythrospermum*), and Svalöfs Panzer reacted by generalized chlorosis to each of the lines.

As a result of these tests, 28 varieties of wheat were selected as differential hosts, and inoculations on these indicated the existence of at least two physiologic forms of *P. secalina*.

Toxopeus (H. J.). **Onderzoekingen over den invloed van temperatuur en vochtigheid op de levensprocessen van Phytophthora parasitica.** [Investigations on the influence of temperature and humidity on the vital processes of *Phytophthora parasitica*.]—*Landbouw*, ix, 8, pp. 385–421, 6 graphs, 1934. [English summary.]

In this further account of his investigations [the results of which are fully discussed and tabulated] from 1928 to 1931 on the relation of environmental factors to the orange gummosis caused by *Phytophthora parasitica* in eastern Java [*R.A.M.*, xii, p. 212], the writer states that infection is most abundant during the second half of the rainy season, outbreaks of the disease being closely connected with heavy precipitation.

The chief habitat of the fungus being the soil, an examination was made of the temperature and moisture content of the upper 2 cm. of soil in a garden at Poenten (1,000 m. above sea level). According to the season the moisture content was found to range from an air-dry condition (10 per cent.) in the dry season to 10 to 50 per cent. during the wet monsoon, while the temperature in a loose moist soil fluctuated between 26° and 60° C. (persistent rain and unbroken sunshine, respectively). Under laboratory conditions the optimum temperature for mycelial growth of the parasite is apparently 31°. A daily increase of temperature for a number of days to 35° suffices to arrest its development, which is resumed, however, after one day on transference to 22°. A daily increase to 40° or above greatly impairs the vitality of the organism, while even an hour's exposure to a temperature of 50° probably destroys it. Mycelial growth occurs only in the presence of moisture. In air-dry soil life is maintained for over six months, but the mycelium is weakened to such an extent that even on transference to very favourable conditions it is unable to start growing until after a fortnight.

Sporangia are formed in profusion from 24° to 29° in the presence of moisture and an abundance of oxygen. The liberation of the zoospores from the sporangia is conditioned by sudden rises or falls of temperature. It was experimentally shown that with initial temperatures above 18° only a drop sets free the zoospores, provided the end temperature is below 24°. With initial temperatures below 15° liberation is effected only by a rise, provided the end temperature exceeds 15°. Hence the rapid drop in temperature at the beginning of a shower is usually sufficient to induce the release of the zoospores. It was further shown that zoospores can be liberated by sporangia kept for three weeks in air-dry soil, while under very humid conditions their release may still be effected after 45 days. After five minutes' exposure to 37° or one hour at 34° the sporangia lose their capacity for zoospore formation. In the soil a daily rise of temperature is particularly injurious to the fungus where the moisture content is low.

From an experiment in which the natural conditions prevailing between 5th and 11th February, 1931, were simulated, it may be concluded that four to six days of dry, sunny weather are enough to prevent zoospore formation at the onset of a shower. During the dry monsoon

the fungus suffers extensively, and only when the wet season is in full swing and the soil is constantly moist for three or four weeks at a time can it recover sufficiently to produce abundant zoospores and so cause fresh infections. Within the wet monsoon only dry periods of at least six days' duration are likely to cause any appreciable damage to *P. parasitica*, the growth of which is then once more temporarily inhibited.

Gumming disease has been observed in Java only at altitudes exceeding 400 to 500 m., the soil temperatures in the plains being evidently too high for profuse mycelial growth or at any rate for zoospore production.

Dufrénoy (J.) & Reed (H. S.). **Effets pathologiques de la carence ou de l'excès de certains ions sur les feuilles des Citrus.** [Pathological effects of the deficiency or excess of certain ions on Citrus leaves.]—*Ann. agron., Paris*, iv, 5, pp. 637–653, 10 figs., 1934.

A brief account is given of the authors' histological examination of citrus leaves affected with mottle leaf disease [*R.A.M.*, xiii, p. 692], the results of which indicated that the trouble appears to be related to the inability of the meristematic tissues of affected trees to use the soluble glucides reaching them; instead of serving for the synthesis of new substances, the glucides are accumulated in the mitochondria which are thus transformed into amyloplasts, the resulting starch being accumulated at the level of the developing buds, the further growth of which is inhibited. Microchemical tests showed that the cells of the leaves of diseased trees do not contain zinc, while this element was found to be comparatively abundant in the ash of leaves from mottle leaf trees which had been sprayed with zinc sulphate. It is believed that zinc salts play a part in the dehydrogenization process of the cell contents, and influence the oxido-reduction potential and consequently the ratio of the nitrites to nitrates in the cells, the former of which are toxic to citrus tissues.

Malençon (G.). **La question du bayoud au Maroc.** [The problem of the baïoud disease in Morocco.]—*Ann. Cryptog. exot.*, vii, 2, pp. 43–83, 6 pl., 1 fig., 1 map, 1934.

After a brief summary of the knowledge so far available of the etiology of the baïoud disease (*Fusarium albedinis*) of the date palm in Morocco [*R.A.M.*, xiii, p. 505] (in which it is stated that the pathogenicity of *F. albedinis* has not yet been established experimentally by inoculations), the author discusses at length his observations in the infected regions of the French Protectorate, all of which tend to confirm the view that this fungus is the primary cause of the trouble. Indirect evidence indicated that the organism enters the host chiefly, if not exclusively, through ragged wounds in the rachides of the leaves, caused by the careless cultural practices of the natives or by accident, while the spread of the infection by pruning tools or by insects would appear to be very exceptional, if it occurs at all. There was ample evidence that once the fungus reaches the stem, it spreads very rapidly upwards and downwards through the trunk, and in cases where several stems arise from one common stock, infection of one invariably leads to the infection of all through their common base. The observations also indicated

that *F. albedinis* remains alive for considerable periods inside the tissues of infected palms even after their death, and that a common source of infection in palm groves is supplied by fallen palm débris, and even by ropes, baskets, and other articles made of the bark or wood of infected palms. As a result of these observations, the author makes some suggestions for the possible control of the spread of the disease, but admits the difficulty of the problem owing to the inertia and ignorance of the local inhabitants.

In dealing with the geographical distribution of the disease in southern Algeria and Morocco, the author states that according to the local popular belief the trouble first started in the valley of the Drâa in Morocco, whence it spread eastwards to the Ziz and subsequently reached Bou-Denib and the south of Algeria. This view, however, should be accepted with reservations, since no mention of the disease is made by de Foucault in his reports on his visit to western Morocco, including the valley of the Drâa, in 1883, although the cultivation of the date palm in that region is briefly discussed by him. The present limits of the disease appear to be: in the north, the Atlas mountain range; in the south, the furthest limit to which the date palm is found; in the west, a line at some distance from the coast marked by the Anti-Atlas and other mountain ranges; and in the east, the eastern Grand Erg, though since it has reached not only the valleys of the Zousfana and Saoura as far south as the Oasis of Buda, but also is extending eastwards in the direction of El Golea through Adjir and Fatis, the main south Algerian date palm areas appear to be threatened. The author believes that the disease is of long standing in several foci in the above-defined area—there are records of what was probably baïoud as far back as 1877—and that its spread has been limited by factors not yet fully understood.

Maublanc (A.) & Roger (L.). **Une nouvelle rouille du Caféier au Cameroun.** [A new Coffee rust in the Cameroons.]—*Bull. Soc. mycol. Fr.*, l, 2, pp. 193–202, 6 figs., 1934.

The authors state that a careful study of the morphology and symptoms of the coffee rust prevalent in the Cameroons, and especially in the Dschang region, which had been previously erroneously attributed to *Hemileia vastatrix* [*R.A.M.*, xiv, p. 31], showed that it is in reality caused by the fungus which they recently described, in the absence of teleutospores in the material then available, under the name *Uredo coffeicola* [ibid., xiii, p. 507]. Subsequently, however, they received further specimens from the Cameroons, containing teleutospores strongly resembling in shape those of *H. vastatrix* but somewhat larger than the latter (about 20 to 25 μ, as against 18 to 24 by 15 to 18 μ for *H. vastatrix*), and also apparently more abundantly formed in nature. For this reason they refer the Cameroons rust to the genus *Hemileia*, but because of the differences in the symptoms caused by it and in the morphology of the uredo stage [which is again described] and of the teleutospores they distinguish it as a new species under the name *H. coffeicola*.

In a brief note appended to this paper, the authors state that the examination of herbarium specimens in the Paris Museum of *Uredo*

gardeniae thunbergiae P. Henn., a fungus which was referred by Sydow to *H. vastatrix*, leads them to separate it as a distinct species under the name *H. gardeniae thunbergiae* [cf. ibid., xii, p. 169]. Teleutospores were present in abundance and both spore forms are morphologically distinct from those of *H. vastatrix*.

Zaprometoff (N. G.). Гоммоз Хлопчатника и борьба с ним. [Cotton gummosis and its control.]—*Борьба за Хлопок* [*Fight for Cotton*], Tashkent, *1934*, 6–7, pp. 61–70, 4 figs., 1934.

This is a very brief, popular account of cotton gummosis (*Bacterium malvacearum*), based chiefly on Massey's work in the Sudan [*R.A.M.*, xiv, p. 96 *et passim*] and on Stoughton's researches on the organism in England [ibid., xiii, p. 301 *et passim*]. The disease is stated to occur wherever cotton is cultivated in the U.S.S.R., and to be fairly destructive in Central Asia, especially on Egyptian cottons, on which the black-arm form of the disease frequently causes losses up to 60 per cent. or more. While no cotton varieties have been found in Russia to be entirely immune from gummosis, recent data received from Transcaucasia would indicate that locally the 'King-karayazski' No. 915 variety exhibits the greatest relative resistance. Experiments in 1929 showed that the incidence of the disease was reduced from 4·3 to 0·3 per cent. by applications of 300 kg. ammonium nitrate per hectare. Control measures, also based on work done abroad, are briefly discussed.

King (C. J.) & Eaton (E. D.). **Influence of soil moisture on longevity of Cotton-rot sclerotia.**—*J. agric. Res.*, xlix, 9, pp. 793–798, 1 fig., 1 graph, 1934.

Fresh sclerotia of *Phymatotrichum omnivorum* [*R.A.M.*, xiv, p. 166] were buried in unsterilized fine sand (containing at saturation about 27 per cent. moisture on a dry weight basis) in pots and tin containers, series of which were maintained at degrees of moisture varying from air-dry to 28 per cent. Samples of the sclerotia were tested for viability at monthly intervals for a year. All the sclerotia in the air-dry and 5 per cent. series were dead at the end of three months; in the 10 per cent. series, they showed a gradual loss of viability after the first two months, but a few were still capable of germination after 12 months. In the 25 per cent. series a larger proportion were viable at each test than at 10 per cent., but here also the viable percentage rapidly decreased after the ninth month. At 28 per cent. (slightly above saturation) only a few of the sclerotia recovered during the first three months were viable, but from the fourth to the tenth month the percentage of viable sclerotia was usually higher than in any other series; this would suggest that some sclerotia were injured by other organisms. Spontaneous germination and hyphal growth occurred at the highest moistures.

Ezekiel (W. N.) & Taubenhaus (J. J.). **Cotton crop losses from Phymatotrichum omnivorum.**—*J. agric. Res.*, xlix, 9, pp. 843–858, 4 graphs, 1 map, 1934.

While the root rot caused by *Phymatotrichum omnivorum* [see preceding abstract] is believed probably to cause more losses to the cotton crop than any other cotton disease in the United States, the evaluation of

the total reduction in yield due to it is difficult owing to the fact that the affected plants may bear a partial crop, and also because conditions favourable to development of the disease also favour the growth of the host. Determinations made in 1931 at College Station, Texas, in plots of Startex (Texas Station No. 7000) cotton plants grown on artificially infected soil, showed that the number of bolls per plant and the weight of lint and seed both per boll and per plant were all lower in plants that were ultimately killed by the disease than in normal ones, the average weight of lint per plant for the former being 2·37 gm. as against 4·61 gm. for the latter. Plants which had perished two months or more before harvesting bore only an insignificant crop, while those that succumbed five weeks before harvest gave half the normal yield, and those which died during the three weeks immediately preceding picking produced practically a normal crop.

Statistical analysis of field data recorded from 1916 to 1927, inclusive, for two permanent cotton plots at Temple, Texas, which were made by two different methods [details of which are given], indicated that the percentage reductions in yield due to root rot in the different years averaged 1·02 times the recorded percentages of plants killed by the disease. From these investigations two tentative rapid methods are suggested for the estimation of cotton crop losses caused by *P. omnivorum*, by the first of which the estimated percentage reduction in yield is the sum of the percentage of plants killed by root rot seven weeks prior to harvest, plus half of the percentage of plants that died between three and seven weeks before picking. By the second method the estimated percentage reduction in yield is the product of the percentage of plants found killed by root rot at picking time multiplied by a 'loss-estimation ratio'. For use in Texas this ratio has been tentatively determined as 0·9. The application of these methods is illustrated by an estimation of the losses in Texas in 1898, which worked out for the whole State at about 8 per cent., equivalent to a loss of about 444,000 bales.

DUPONT (P. R.). **Work connected with insect pests and fungus diseases.** —*Rep. Dep. Agric. Seychelles, 1933*, p. 5, 1934.

Promising results have been obtained in preliminary tests on the infestation of the Lecaniid scale insects parasitizing coffee, especially *Lecanium viride*, by a virulent strain of *Cephalosporium lecanii* [*R.A.M.*, xiii, pp. 90, 302] of Indian origin supplied by the Imperial Mycological Institute.

MANSOUR (K.). **On the intracellular micro-organisms of some Bostrychid beetles.**—*Quart. J. micr. Sci.*, N.S., lxxvii, 2, pp. 243–253, 2 pl., 1934.

An account is given of the writer's studies at Cairo on the mycetomata found in the beetles *Rhizopertha dominica* F., *Sinoxylon ceratoniae* L., and *Bostrychoplites zickeli* Mars, the first-named a cosmopolitan pest of stored foodstuffs and the two others wood-eaters [cf. *R.A.M.*, xiv, p. 167]. The mycetomata are transmitted from one host generation to the next through the reproductive organs, and remain throughout life entirely isolated from the alimentary tract, so that their alleged

auxiliary role in the digestive processes of the insects may be regarded as open to doubt.

Mansour (K.). **On the so-called symbiotic relationship between Coleopterous insects and intracellular micro-organisms.**—*Quart. J. micr. Sci.*, N.S., lxxvii, 2, pp. 255–271, 2 pl., 1934.

Evidence is adduced in support of the writer's view that the relationship between the intracellular organisms found in certain Coleopterous insects is commensal rather than symbiotic [*R.A.M.*, xiii, p. 440, and preceding abstract]. The following are among the facts on which this conclusion is based. Certain of the woods on which the insects feed have been found to possess a relatively high proportion of available nutrients which can be ingested without external aid. In some cases the micro-organisms only pass into the alimentary tract of the insect during the adult stage when wood ingestion is not in progress, while in others they never enter this region. Similar mycetomata to those commonly associated with wood-eating insects have been found in other groups, e.g., grain pests, in which no question of a symbiotic function arises.

Ninni (C.) & Fittipaldi (C.). **Différence de développement de certaines souches de mycètes blastosporés cultivées sur gélose Sabouraud phéniquée. (Note II).** [A difference in the development of certain strains of blastosporous fungi grown on phenolic Sabouraud's agar.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vi, 11, pp. 443–445, 1934.

When 12 members of the Mycotoruleae, 5 chromogenous and 7 non-chromogenous Torulopsidaceae [*R.A.M.*, xiv, p. 235], and *Saccharomyces cerevisiae* were sown on Sabouraud's medium to which carbolic acid was added at concentrations ranging from 1 in 5,000 to 1 in 1,000 no noteworthy morphological changes occurred, but while the Mycotoruleae grew at the highest acid concentration, the non-chromogenous Torulopsidaceae grew only exceptionally at one of 1 in 2,000 and the chromogenous strains failed to grow at one of 1 in 5,000. A definite correlation was established between the normal reproductive ability of these organisms (which can be verified microscopically after six hours) and that shown in the highest concentrations of acid on the medium used.

Ninni (C.) & Fittipaldi (C.). **Conditions d'infection du cobaye par les mycètes du type Candida. Vitalité réduite de ces mycètes au cours des infections expérimentales. (Note III).** [Conditions of guinea-pig infection by fungi of the *Candida* type. Reduced vitality of these fungi during experimental infections. (Note III).]—*Boll. Sez. ital. Soc. int. Microbiol.*, vi, 12, pp. 469–474, 1934.

In a study of the anatomical and pathological changes induced in guinea-pigs inoculated in different organs with different doses of blastosporous fungi the authors found that four to ten peritoneal inoculations at four-day intervals with a species of *Candida* isolated by themselves and with *C. mycotoruloidea* Redaelli gave consistently positive results at concentrations of 1 part of a culture on agar to 50 to 100 parts of

water, though similar inoculations with an anascosporous yeast from sputum gave negative results. Repeated subcutaneous injections with the authors' *Candida* produced abscesses with a secondary granulomatous reaction, peritoneal inoculations with the same fungus producing a local granuloma after the third injection, visible even when the animals were destroyed two days after this. Guinea-pigs inoculated six times with the authors' *Candida* constantly showed the formation of granulomata in the liver. The same results were given by *C. mycotoruloidea*, but more rapidly. It is concluded that the best means of reproducing specific granulomata lies in making repeated inoculations at intervals of four or six days at a dosage of 1 : 100.

Fungi of the *Candida* type were present in all the organs of the guinea-pigs 15 days after inoculation, and in the spleen 20 days after.

Ninni (C.) & Fittipaldi (C.). **Allergie et réactions d'hyper-réceptivité et d'immunité au cours des infections expérimentales par les mycètes blastosporés. (Note IV).** [Allergy and hyper-receptivity and immunity reactions in experimental infections with blastosporous fungi. (Note IV).]—*Boll. Sez. ital. Soc. int. Microbiol.*, vi, 12, pp. 414–479, 1934.

After pointing out that in certain subacute or chronic diseases such as tuberculosis and glanders, infection increases the sensibility of the organism, so that any new introduction of the antigen induces an acutely infectious reaction, the authors describe a similar form of allergy in certain fungal infections. When guinea-pigs were given peritoneal inoculations with the species of *Candida* isolated by them, *C. mycotoruloidea* Redaelli, and a non-pathogenic anascosporous yeast [see preceding abstract], those inoculated with the first two showed intradermal reactions to the 'lévurine' (proteid culture extracts) prepared from all three fungi, while the controls and the animals inoculated with the non-pathogenic fungus gave no reaction. The reaction obtained consisted in the production of a papula 1 cm. or more in diameter, usually white at the centre and red at the periphery, appearing 10 to 15 days after the injection and persisting up to the fortieth day or longer.

Guinea-pigs given one large intraperitoneal injection or four small ones of the authors' *Candida* were inoculated in the peritoneum 10 and 30 days later with a 1 : 50 culture of the same organism. Haemorrhage was found to set in in half-an-hour, though control animals that had not received a previous injection did not show this reaction. Further, whereas in the controls the fungus could be found everywhere in the peritoneal cavity, in the previously inoculated animals it was present, half-an-hour later, only in the epiploön. This indicates the existence in the previously inoculated animals of induced resistance resulting in the removal from the cavity by fixation in the epiploön of the subsequently introduced organisms. The intensity of the hypersensitive phenomena, however, tends to mask this induced resistance.

Wong (A.) & Kurotchkin (T. J.). **Monilia vulvo-vaginitis.**—*Chin. med. J.*, xlviii, 10, pp. 1058–1065, 1 pl., 1934.

An account is given of the clinical and mycological studies on three cases of vulvo-vaginitis [*R.A.M.*, xii, p. 370] examined at the Peking

Union Medical College. The responsible organism was identified (on a sugar reaction basis) [cf. ibid., xiii, p. 767] in the first two cases as *Monilia* [*Candida*] *pinoyi* and in the third as *M.* [*C.*] *macedoniensis*.

Da Fonseca (O.). **Allergides mycosicas.** [Mycotic allergies.]—Reprinted from *Rev. med.-cirurg. Brazil*, xlii, 9–10, 11 pp., 14 pl., 1934.

This is an historical review of the allergic conditions that have been observed to result from localized infections with dermatophytes and their cure in certain cases by vaccines.

Castellani (A.). **Tinea imbricata (tokelau). A short general account with report of a case in a European.**—*J. trop. Med.* (*Hyg.*), xxxvii, 23, pp. 363–367, 2 col. pl., 1934.

Observations are made on the history, synonymy, geographical distribution, and etiology of tinea imbricata or tokelau, on the classification and cultivation of the fungi implicated in the disorder, and on the medical aspects of the condition, several clinical and etiological varieties of which are recognized [*R.A.M.*, xiv, p. 35]. A brief note is also given on a severe case of long standing in a European, contracted in Arabia.

At least two fungi must be admitted as agents of tinea imbricata, viz., *Trichophyton* (*Endodermophyton*) *tropicale* and *T.* (*E.*) *indicum*, the cultural characters of which are described and compared. *T. tropicale* forms amber-coloured colonies on glucose agar and greyish-white ones on Sabouraud's, plain, and glycerol agars; 'duvet' is absent, except from old cultures on glucose agar. The colonies of *T. indicum* on glucose agar are deep orange to pinkish or red, on the other media white, and 'duvet' is generally present.

Castellani (A.) & Jacono (I.). **Acladiosis and paracladiosis.**—*J. trop. Med.* (*Hyg.*), xxxvii, 23, pp. 360–363, 3 pl. (1 col.), 1934.

The authors recently investigated in a male Chinese a condition closely resembling acladiosis due to *Acladium castellanii* [*R.A.M.*, vii, p. 240] but found on more thorough investigation to be caused by a different organism which was determined as a new variety of *Ascotricha chartarum* Berk. and named var. *orientalis* Cast. & Jacono. Full particulars are given of both diseases, the new one being termed 'paracladiosis'.

A. chartarum var. *orientalis* forms yellowish or brownish colonies, often with superficial spicules, on ordinary media. In glucose broth the mycelium is abundant and composed of septate, branched, anastomosing hyphae, measuring 2·5 to 3·8 μ. Intercalary chlamydospores may be present. Conidiophores are formed from the fifth or sixth day onwards. They are thick, brownish, and bear small bunches of pedunculate (aleuro) conidia, spherical, hyaline to greenish or brownish, and 3 to 4 μ in diameter. Gelatine is liquefied and milk peptonized.

The *Sporotrichum*-like conidia at first pointed to inclusion in that genus, but the examination of cultures by Prof. Curzi led to the detection of asci closely resembling those of *A. chartarum*, a culture of which was subsequently obtained from Berlin. Inoculations with the latter having given negative results on human volunteers, the human pathogen

is believed to be a biologic variety. The conidia of *A. chartarum* are spherical or slightly apiculate, occasionally piriform, 4 to 7 μ in diameter, with a smooth or slightly verrucose surface; the globular or subglobular, very short-necked perithecia are surrounded at the base by large, branched 'hairs', terminating in a large, hyaline, ampulliform cell. These hairs are considered to be conidiophores, some of which terminate in one or more hyaline segments separating as conidia. According to Preuss and Hallier (cited by Rivolta) a fatal mycosis of bees is induced by *A. chartarum*. The asci measure 65 by 11 μ and each contains eight brownish or black ascospores.

KOBAYASI (T.). **Über einen typischen Fall von Sporotrichose.** [On a typical case of sporotrichosis.]—*Jap. J. Derm. Urol.*, xxxvi, 6, pp. 665–676, 6 figs., 1934. [Japanese, with German summary on pp. 114–116.]

From the ulcerous lesions on the back of the left hand and forearm of a Japanese woman the writer isolated a fungus which formed, on Sabouraud's maltose agar at 27° to 31° C., circular, black, glistening colonies, furcate to cerebriform in the centre, smooth towards the periphery, with a greyish-white, radial halo, 2 to 3 mm. broad; on ordinary nutrient agar (4 per cent. maltose) the culture is butter-coloured and a profuse aerial mycelium develops, while on sugar-free agar the colonies are white and stellate. Milk is coagulated and gelatine liquefied. The irregularly septate, straight or slightly curved, hyaline, sporiferous hyphae, averaging 2 μ in width, bear on denticulae (2 by 0·3 to 0·6 μ), singly or in groups or clusters, oval, brown to brownish-black spores, 3 to 6 by 2 to 4 μ. The organism is identified as *Sporotrichum beurmanni* [*R.A.M.*, xiv, p. 168] or possibly a variety of the same. Positive results were obtained in inoculation tests on rats.

LEA (C. H.). **A note on taint production in the fat of chilled beef.**—*J. Soc. chem. Ind., Lond.*, liii, 51, pp. 391T–392T, 1 graph, 1934.

Data are presented showing the correlation between a high free acid content and the occurrence of mould (*Mucor*) spoilage in chilled beef fat [cf. *R.A.M.*, xiii, p. 702]. The tallowy or oily flavour imparted to the fat by protracted storage in atmospheres containing carbon dioxide is not usually considered so objectionable as the taints associated with fungal or bacterial deterioration.

ALLEN (RUTH F.). **A cytological study of heterothallism in Flax rust.**—*J. agric. Res.*, xlix, 9, pp. 765–791, 13 pl., 1934.

This is a detailed account of the author's cytological investigations of heterothallism in flax rust (*Melampsora lini*), some of which have already been noticed from another source [*R.A.M.*, xii, p. 632]. In addition, it is stated that the sporidial germ-tubes enter the epidermal cells of the host, in which each forms a primary hypha of several uninucleate cells; this hypha branches and grows into an intercellular haploid mycelium, the cells of which are one- to four-nucleate. Spermogonia are first formed at the upper and later at the lower surface of the flax leaf; their hyphae are predominantly uninucleate (85 in a count of 100) and mass between the epidermis and the

palisade cells. Paraphyses grow out through a stoma, forming an ostiole [ibid., xii, p. 362] from which the uninucleate spermatia ooze out. Later, the epidermis covering the spermogonium is sloughed off. When placed on the surface of an infected area bearing spermogonia, the spermatia germinate and enter the leaf, probably growing in through the spermogonia, but perhaps also penetrating through epidermal cells; they grow then into an intercellular mycelium, the hyphae of which are at first very slender but later of normal appearance, the indications being that these hyphae obtain food from the sporidial hyphae. Soon afterwards the predominantly uninucleate hyphae of both sexes extend to the epidermis (either upper or lower), abstrict one to four layers of buffer cells, and then fuse by pairs to form 'two-legged' cells; the majority of the fusion cells are binucleate, but deviations and irregularities are common. Each of the fusion cells cuts off terminal binucleate spore initials, each of which again divides repeatedly into the definitive spore and the intercalary cell, giving rise to a chain of spores. The open aecidia begin to shed spores about four days after spermatia are placed on an infection.

GROSSMANN (HELENE). **Untersuchungen über die Welkekrankheit des Flachses.** [Investigations on the wilt disease of Flax.]—*Phytopath. Z.*, vii, 6, pp. 545–583, 3 graphs, 1934.

A detailed, tabulated account is given of the writer's physiological studies at the Federal Technical College, Zürich, on flax wilt (*Fusarium lini* Bolley) [*R.A.M.*, xii, p. 220], of which a highly virulent strain (424), supplied by Prof. Stakman from Minnesota, was used.

Both the susceptible Newland and the resistant Bison variety showed the highest degree of infection at a soil temperature of 27° C.—the optimum for the growth of the host. Bison contracts the disease only when the temperature is raised immediately after germination; seedlings grown at 12° for 15 days are resistant at all temperatures.

The filtrate of a culture of *F. lini* on Richards's or a similar nutrient solution was found, after six weeks' growth of the fungus, to be toxic to flax at a dilution of 1:5, no injurious effect being exerted at this strength by the original medium. The toxin appears to be a chemical substance, neither volatile nor thermolabile, and extractable with methyl alcohol from the vacuum distillation residue of the culture liquid. Like the toxin of *F. lycopersici* [see next abstract], with which it may in fact be identical, the toxic principle of *F. lini* inhibits seed germination. It is not specific in its action, being equally injurious to the resistant Bison as to the susceptible Newland variety, and further causing wilting of *Prunus padus* and *Sorbus* [*Pyrus*] *aucuparia*. The higher the room temperature the more rapid is the course of the wilting caused by the toxin in flax plants.

LUZ (G.). **Über den Stoffwechsel von Fusarium lycopersici und Fusarium lini.** [On the metabolism of *Fusarium lycopersici* and *Fusarium lini*.]—*Phytopath. Z.*, vii, 6, pp. 584–638, 4 figs., 15 graphs, 1934.

A very comprehensive, fully tabulated account is given of the writer's studies at the Federal Technical College, Zürich, on the metabolism of *Fusarium lycopersici* [*R.A.M.*, xii, p. 714] and *F. lini* [see preceding

abstract] grown in pure culture on a modified Richards's solution consisting of 50 gm. glucose, 10 gm. ammonium nitrate, 5 gm. monopotassium phosphate, 2·5 gm. magnesium sulphate, 0·02 gm. iron chloride, and 1 l. distilled water (P_H value 3·9).

Four phases were distinguished in the process of alteration of the reaction of the medium by the fungi during their growth, viz., (1) decline of the P_H value from 3·9 to 3·2; (2) rise to 7·5; (3) fall to about 7·2 or no change; and (4) rise to 8·5. The first phase is associated with the predominance of anions following the formation of organic acids, the second with the selective assimilation by the fungi of nitrate in preference to ammonium nitrogen, the third with the exclusive intake of ammonium, and the fourth with the gradual consumption of organic acids due to incipient sugar shortage. Two periods of development may also be differentiated, the close of the first being marked by a break in the curve of growth and a fall in the ash content coinciding with one in sugar consumption; in the second period the main source of carbon is ethyl alcohol, the chief metabolic product of sugar assimilation. Both volatile and non-volatile organic acids were detected in the cultures, the latter including traces of oxalic and tartaric acids. Albumin compounds were secreted in older cultures.

The most active substances in the causation of tomato wilt by *F. lycopersici* appear to be formed in conjunction with the death of the mycelium and are not direct transformation products of sugar metabolism. A strongly toxic action on the plant was exercised by ammonia, considerable quantities of which were present in the medium during the more alkaline phases of growth. Ethyl alcohol was also toxic at a concentration of 2 per cent.

Calinisan (M. R.). **Notes on a suspected mosaic of Abacá in the Philippines.**—*Philipp. J. Agric.*, v, 4, pp. 255–257, 1 pl., 1934.

In the course of field observations in 1933 on bunchy top of abacá [*Musa textilis*: *R.A.M.*, xiv, p. 37] in the province of Davao, Philippine Islands, the writer noticed characteristic symptoms suggestive of mosaic disease in a number of plantations.

The conspicuous mottled areas on the leaves consist of yellowish-green, sometimes broken, streaks, involving both surfaces, the midrib, and petiole. The streaks may extend parallel with the veins from the midrib to the leaf margins and in advanced stages the yellowing is pronounced. Mottling may also occur on the unfolded young leaves. From the first appearance of the symptoms (which may be at any stage of growth) each newly formed leaf is similarly affected. Early attacks are followed by more or less severe stunting.

The symptoms of this abacá trouble are similar to those of the virus disease recently reported by Magee from New South Wales [ibid., x, p. 472]. At present the occurrence of the former is sporadic and its effects relatively slight as compared with those of bunchy top and stem rot [see next abstract], but it interferes with the normal growth of the plants and may somewhat reduce the yield. The incidence of infection in different parts of one plantation was found to range from 7·7 to 100 per cent.

Field trials showed that the abacá mosaic is introduced into new plantings and spreads in them by the use of suckers from diseased stools.

The roguing and burning of infected hills have given promising results in preliminary experiments on the control of the disease.

Agati (J. A.), Calinisan (M. R.), & Aldaba (V. C.). **Further studies on the stem-rot of Abacá in the Philippines.**—*Philipp. J. Agric.*, v, 4, pp. 191–211, 10 pl., 1934.

Continuing their studies on stem rot of abacá [*Musa textilis*: *R.A.M.*, xi, p. 300], the writers found the disease assuming a serious aspect in the mountainous districts of Cavite Province, where its occurrence was favoured by prolonged drought; it has also been observed in a milder form in other localities. The Baluñganon and Putian varieties showed the most severe infection (nearly 50 per cent.) in each of the years 1932 and 1933. The causal organism, a species of *Helminthosporium* identified by S. P. Wiltshire as *H. torulosum* [ibid., xiii, p. 787], attacks the leaf sheaths of both abacá and banana (Butuhan, Saba, and Latundan varieties) and the green fruits of the latter (Latundan, Lacatan, and Bongolan). At an advanced stage of the deep-seated necrosis induced by the fungus the affected stems collapse. Cross-inoculation experiments with *H. torulosum* from banana and abacá gave positive results on both hosts under laboratory, greenhouse, and field conditions. The optimum temperature range for the growth of the fungus was found to lie between 25° and 30° C. It may survive the winter in the dry tissues of its hosts or on refuse in the soil. Suggestions are made for the control of the disease by improved cultural practices.

Severin (H. H. P.). **Experiments with the Aster-yellows virus from several States.**—*Hilgardia*, viii, 10, pp. 305–325, 4 figs., 1934.

Experiments [the results of which are tabulated and discussed] are described in which the virus of aster yellows [*R.A.M.*, xii, p. 446] from New York, Indiana, Wisconsin, and California, as well as that of carrot yellows [ibid., xii, p. 136] from Maine and Idaho, was successfully cross-inoculated by previously non-infective leafhoppers (*Cicadula sexnotata*) to carrots and asters. Celery was highly resistant to the virus from both these hosts from all localities except California. Yellows was similarly transmitted from naturally infected celery from Utah to asters.

Severin (H. H. P.) & Haasis (F. A.). **Transmission of California Aster yellows to Potato by Cicadula divisa.**—*Hilgardia*, viii, 10, pp. 329–335, 4 figs., 1934.

In experiments [which are described, and the results of which are tabulated and discussed] conducted in California to ascertain whether potato plants could be infected with Californian aster yellows [cf. *R.A.M.*, x, p. 734, and preceding abstract] by means of the leafhopper *Cicadula sexnotata*, 50 per cent. of the inoculated plants developed symptoms of the disease, but all attempts to recover the virus from the affected plants gave negative results.

Severin (H. H. P.). **Transmission of California Aster and Celery-yellows virus by three species of leafhoppers.**—*Hilgardia*, viii, 10, pp. 339–361, 1 col. pl., 2 figs., 1934.

Experiments [which are described, and the results of which are tabulated and discussed] on the transmission of Californian aster and

celery yellows [see preceding abstracts] by three species of leafhoppers showed that *Thamnotettix montanus* Van D., which was found to be a natural vector of celery yellows, gave 2·9 and 26·1 per cent. successful transfers of yellows from all sources to asters and celery, respectively. It also caused infection of carrots, White London mustard (a new host), Prickly Winter spinach, Prizehead lettuce, and *Plantago major*.

T. geminatus failed to transmit yellows to healthy asters from naturally infected asters or from asters and celery experimentally infected by *Cicadula sexnotata*. The transmission of yellows from all sources to celery by *T. geminatus* averaged 13·7 per cent. When only a single insect was used the percentage of transmission fell to 2·5. This leafhopper also experimentally transmitted carrot yellows to Short White and White Belgian carrots.

C. sexnotata and *T. montanus* transferred the virus from naturally infected asters to 48·3 and 20 per cent. of healthy celery plants, respectively. In the recovery of the virus from experimentally infected celery in one experiment *C. sexnotata* transferred the virus to 100 per cent. of healthy aster and celery plants, while *T. montanus* failed to transmit it to healthy asters, but transferred it to 44·4 per cent. of healthy celery plants. As both insects failed to separate the viruses of aster and celery yellows, it is considered that only one virus is concerned.

Green (D. E.). **Common diseases of the Rose.**—*J. R. hort. Soc.*, lix, 6, pp. 470–476, 4 pl., 1934.

This is a popular account of the symptoms and life-histories of some well-known pathogens of the rose in England, with directions for their control by thorough sanitation and fungicidal treatments. The diseases enumerated are mildew (*Sphaerotheca pannosa*), black spot (*Diplocarpon rosae*) [*R.A.M.*, xi, p. 375; xii, p. 223], cankers due to *Coniothyrium* [*rosarum* and *Leptosphaeria coniothyrium*: ibid., xiii, p. 637], rust (*Phragmidium mucronatum*), crown gall (*Bacterium tumefaciens*) [ibid., xiii, p. 114 *et passim*], *Gnomonia rubi* [ibid., xii, p. 447], hitherto reported only from the Royal Horticultural Society's Garden at Wisley, Surrey, *Botrytis cinerea*, physiological chlorosis, downy mildew (*Peronospora sparsa*) [ibid., xi, pp. 459, 784], and silver leaf [*Stereum purpureum*: ibid., xii, p. 447].

Schwarz (F.). **Mehltaubekämpfung bei Rosen.** [Mildew control in Roses.]—*Blumen- u. Pflanzenbau verein. mit Gartenwelt*, xxxviii, 45, p. 569, 1934.

Attention is drawn to the necessity of using the right brand of sulphur for the efficient control of rose mildew [*Sphaerotheca pannosa*]. The best is considered to be 'ground Sicilian sulphur double refined, for vaporization' [*R.A.M.*, xiv, p. 37]; in this form it can also be used for dusting, but it may be obtained in bars. Susceptible varieties should be treated twice weekly and there is no difficulty in keeping them healthy by this method.

Rupprecht (G.). **Schwefel und Schwefelverneblung gegen Mehltau.** [Sulphur and sulphur vaporization against mildew.]—*Blumen- u. Pflanzenbau verein. mit Gartenwelt*, xxxviii, 49, pp. 613–614, 1934.

Particulars are given of the construction, application, and costs of the various types of 'sulfurator' apparatus used in Germany for the

control by sulphur vaporization of rose mildew [*Sphaerotheca pannosa*: see preceding abstract] and other fungous diseases of greenhouse plants.

KAWAMURA (E.). **Bacterial leaf spot of Sunflower.**—*Ann. phytopath. Soc. Japan*, iv, 1–2, pp. 25–28, 1934.

The occurrence on [the cucumber-leaved] sunflower (*Helianthus debilis* Nutt.) leaves in the Hukuoka district of Japan of dark brown, green-bordered, coalescent lesions is attributed to a new species of bacterium, *Bacterium helianthi*. The spots are at first minute and water soaked, then expand to 2 or 3 mm. in diameter and darken. Large dead areas may be formed by coalescence, up to 60 or 70 spots per leaf having been observed. The organism measures 1·6 to 2·4 by 1 to 1·4 μ, occurs singly or in short chains, and is motile by means of a single polar flagellum, the length of which frequently exceeds that of the rod. It is Gram-negative; forms round, white colonies on beef agar; peptonizes milk and reduces litmus; does not liquefy gelatine; produces gas from nitrate and acid from saccharose and glycerine without gas; minimum, optimum, and maximum temperatures for growth: below 12°, 27° to 28°, and 35·5° C., respectively, thermal death point 52°. Inoculation experiments with aqueous suspensions of the organism gave positive results on *H. debilis* and [the common sunflower] *H. annuus*.

BARTHELET (J.). **Sur une maladie des Rhododendrons.** [On a disease of Rhododendrons.]—*Rev. Path. vég.*, xxi, 2–3, pp. 31–35, 3 pl., 1934.

Hybrid rhododendrons growing in damp, shady conditions in a nursery in France developed in 1932 a wilt which caused the death of the whole plant. Infection was stated to have apparently occurred through the lower branches, whence it passed to the main stem but remained confined to the parts above the graft. In some cases it started from the terminal buds of the twigs. Isolations from the diseased material yielded a fungus which formed a whitish, pulverulent growth with pyriform, sometimes irregular, sporangia, 28 to 40 by 22 to 26 (average 35 by 25) μ, provided with a wall 0·8 to 1 μ thick and a well-developed papilla. Germination was usually by zoospores, but sometimes on solid media irregular germ-tubes were formed and bore secondary sporangia. Oospores developed later and were spherical, 25 to 30 μ in diameter, and with a wall averaging 2 μ thick. The antheridia, usually from the same hypha as the oogonium, were paragynous but sometimes partly surrounded the oogonial stalk, giving a false impression of amphigynous formation. The oospores germinated by one or more germ-tubes, which in some cases soon produced sporangia. Chlamydospores were also produced and germinated in the same manner as the oospores. The fungus closely resembles *Phytophthora cactorum*, reported on rhododendrons in America [*R.A.M.*, ix, p. 390], except in the somewhat smaller oospores described by Chester in his studies of this species on lilac [ibid., xi, p. 580].

REYES (G. M.). **A sclerotial stem rot of Everlasting, Helichrysum bracteatum Willd.**—*Philipp. J. Agric.*, v, 4, pp. 259–261, 263, 1 pl., 1934.

An account is given of a destructive stem rot and wilt of *Helichrysum*

bracteatum first observed at Manila in 1934 and caused by a species of *Sclerotium* identified on morphological and physiological grounds with *S. rolfsii*. Other Philippine hosts of the fungus include groundnut, rice [*R.A.M.*, vi, p. 371], wheat, onion, and eggplant, various other economic plants, and *Aeginetia indica*, a troublesome phanerogamic parasite of sugar-cane and banana [ibid., ii, p. 109]. Both *H. bracteatum* and *A. indica* are believed to be reported for the first time as hosts of *S. rolfsii*, the control of which by cultural measures is briefly indicated.

Nilsson-Leissner (N.). **New host species of the Clover stem rot (Sclerotinia trifoliorum).**—*Bot. Notiser, 1934*, 5-6, pp. 428 436, 3 figs., 1934.

The first part of this paper is a summary of the author's studies (with N. Sylvén) on the life-history, alternate hosts, and other features of the clover stem rot fungus (*Sclerotinia trifoliorum*) in Sweden [*R.A.M.*, viii, p. 793]. In the second part the detection of the sclerotia of the organism on the root system and leaves of a large number of *Geranium dissectum* plants in an alsike clover (*Trifolium hybridum*) field at Svalöf in March, 1934, is briefly described, one *Myosotis arvensis* being similarly affected. Apothecia corresponding in all respects with Frank's description developed on some *G. dissectum* plants transferred to boxes which were placed in the garden for the summer. Inoculation experiments under controlled conditions with these apothecia gave positive results on *T. hybridum*, *T. repens*, *T. pratense*, *G. dissectum*, and *M. arvensis* in pots, and by the middle of October sclerotia had developed on some wilted plants of the first-named host which, with *G. dissectum*, showed the heaviest infection. The occurrence of the clover pathogen on farm weeds of different families is considered largely to explain its longevity in the field.

Pittman (H. A.). **Some important fungal diseases of Grape Vines and fruit trees in Western Australia and their control.**—*J. Dep. Agric. W. Aust.*, 2nd Ser., xi, 3, pp. 488–506, 8 figs., 1934.

Short popular notes are given on the symptoms and control of the following plant diseases found in Western Australia, viz., vine powdery mildew (*Uncinula necator*) [*R.A.M.*, xiii, p. 745], vine black spot or anthracnose (*Gloeosporium ampelophagum*) [ibid., xiii, p. 148], peach leaf curl (*Taphrina deformans*) [ibid., xiii, p. 452], shot hole of stone fruits (*Clasterosporium carpophilum*) [ibid., xiii, p. 582], apricot green rot (*Sclerotinia sclerotiorum*) [ibid., xi, p. 157], citrus brown rot (*Phytophthora hibernalis* and *P. citrophthora*) [ibid., xiii, p. 25], stem-end browning or anthracnose of navel oranges (*Colletotrichum gloeosporioides*), pear black spot (*Venturia pirina*) [ibid., xiii, p. 782], and apple powdery mildew (*Podosphaera leucotricha*) [ibid., xiii, p. 522].

Rada (G. G.). **Tres enfermedades del Manzano.** [Three diseases of the Apple.]—*Circ. Estac. exp. agric. La Molina* 25, 21 pp., 11 figs., 1934.

Semi-popular notes are given on the symptoms, etiology, and control of apple scab (*Venturia inaequalis*), powdery mildew (*Podosphaera leucotricha*), and black rot (*Physalospora cydoniae* or *P. malorum*) [(?) *P.*

obtusa: *R.A.M.*, xiii, p. 313]. Scab has been reported from the Rímac Valley but probably occurs also in other parts of Peru. Powdery mildew has been observed in the Lima Valley and at the La Molina Agricultural Experiment Station. Black rot is recorded from the Rímac Valley and the Tacna Department.

CHRISTOFF (A.). **Mosaikkrankheit oder Virus-Chlorose bei Äpfeln. Eine neue Virus-krankheit.** [Mosaic disease or virus chlorosis in Apples. A new virus disease.]—*Phytopath. Z.*, vii, 6, pp. 521–536, 7 figs., 1934.

From 1930 to 1934 the writer investigated a virus disease of apple and other fruit trees (including pear, quince, apricot, peach, and plum) which is stated to be on the increase in nearly all Bulgarian nurseries, causing losses of up to 6 per cent. of the trees. The pale green, polygonal spots are most conspicuous on crab-apples. On grafts the disease commonly assumes the form of chlorosis, accompanied by scorching of the leaf blade and in many cases by complete desiccation. At the same time necrosis sets in at the root tips and involves the phloem of the tap-root and stem. The decayed areas are invaded by secondary parasites or saprophytes which hasten the collapse of the affected tree. Inoculation experiments with a number of these organisms gave negative results, but *Diplodia pseudodiplodia* (*Physalospora malorum*) [? *P. obtusa*: see preceding abstract] produced symptoms simulating the foregoing; it was, however, definitely ascertained not to be the primary agent of the disease, the virus origin of which is considered to have been established by experiments [some details of which are given] in which apples were budded with buds from trees showing the chlorosis, and in several cases developed typical symptoms of the disease.

Affected trees sometimes gradually recover from the disturbance. Experiments are in progress to determine whether the fruits of mosaic trees contract 'bitter pit' symptoms [ibid., xiv, p. 242].

Of recent years the writer has observed the occurrence of mosaic on a large number of other Rosaceous hosts besides those mentioned above, e.g., almond, cherry (*Prunus cerasus* and *P. avium*), *P. divaricata*, *P. insititia*, *P. mahaleb*, *P. spinosa*, and wild roses. The author states that the virus from rose haws is transmissible to pears and apples, that from plums, quinces, and pears to apples, and that from apples to haws and pears, thus indicating the complexity of the problem.

Control measures should include the destruction of all infected wild material in the nurseries; use of scions from healthy trees; prohibition of apple-planting in heavily infested nurseries; and extermination of aphids and gnawing insects on the trees.

KÜTHE (K.). **Bekämpft die Obstbaumkrankheiten!** [Combat fruit tree diseases!]—*Dtsch. landw. Pr.*, lxi, 51, p. 631, 1 diag., 1934.

Inoculation experiments at the Landsberg (Warthe) Agricultural Experiment Station are stated to have shown that there is a strong tendency to physiologic specialization in the apple scab fungus [*Venturia inaequalis*], monospore cultures of which from a given variety attacked the same variety with particular facility while leaving some others practically untouched [cf. *R.A.M.*, x, p. 464].

Güll (A.). **Ursachen für die wechselnde Anfälligkeit der Obstbäume gegen die Schorfkrankheit (Fusicladium).** [Causes of the variable susceptibility of fruit trees to the scab disease (*Fusicladium*).]—*Obst- u. Gemüseb.*, lxxx, 12, p. 183, 1934.

The necessity is briefly emphasized of selecting apple, pear, and cherry varieties well adapted to withstand *Fusicladium* [*Venturia inaequalis*, *V. pirina*, and *V. cerasi*] in the particular localities where they are to be cultivated [see preceding abstract]. Reaction to these diseases, however, varies considerably with environmental conditions, the reputedly resistant pears, Williams' Bon Chrétien and Charneu Delicious, for instance, being very susceptible to *V. pirina* in the damp climate of the Hamburg district. An instance has been observed in which standard Beauty of Boskoop apples were severely attacked by *V. inaequalis* from which the adjacent espaliers of the same variety remained free, while in another orchard old, dwarf Bonne Louise pear trees were completely healthy in the midst of infected standard trees of the same variety. Soil constitution and the type of stock used are probably important factors in scab development.

Petri (L.). **Degenerazione e necrosi del cambio dei Peri e dei Meli nel Trentino e in Alto Adige.** [Degeneration and necrosis of the cambium of Pear and Apple trees in the Trentino and the Upper Adige.] —*Boll. Staz. Pat. veg.*, *Roma*, N.S., xiv, 3, pp. 281–326, 24 figs., 1934.

The most serious disease of apples and pears (affecting trees 10 to 30 years old) in the provinces of Trento and Bolzano, northern Italy, is a wilt which is becoming more prevalent every year. The first symptoms become noticeable when vegetation is renewed; the blossoms wither and develop necroses, or the young fruits lack turgidity and turn black or drop; the leaves remain small, and are of the 'rosette' type; they are rolled in at the edges, brittle, and sometimes yellowish and deformed. The leaves at the extremities of the branches are generally dead by April, but always remain attached to the twig and are brown, as if killed by cold. The condition never affects all the branches simultaneously, and is confined to the scion, the stock remaining healthy. The roots appear to be unaffected. Affected branches die during the year of attack, or if the necrosis becomes arrested at the base, death ensues the following year. The whole aerial part dies in two or three years or may succumb suddenly. Internally the phloem and cambium are rust- or chestnut-coloured, but the woody cylinder remains free from discoloration.

Histological examination showed the symptoms to be due to degeneration of the cambium and the daughter cells in proximity to it, and the arrest of meristematic activity, this being followed by necrosis of the whole cambial zone and the deeper layers of the phloem. In the early stages there is a disordered cambial activity resulting in an irregular proliferation of a cataplastic tissue of undifferentiated cells, mostly on the phloem side and destined to undergo early necrosis. The pathological condition of the cambium is apparently set up at the branch tips and spreads towards the base, though this requires further investigation.

Though there is a certain resemblance to the action of frost, the cambial proliferation preceding necrosis is rather against this explanation of the injury.

Various fungi and bacteria were isolated from affected material, but their pathogenicity was not established, and the cause of the condition, whose manner of spread suggests that it is infectious, has not yet been ascertained.

The paper concludes with brief suggestions for testing as a means of control the Californian zinc sulphate treatment for little leaf [*R.A.M.*, xiii, p. 39; xiv, p. 176].

Pierstorff (A. L.) & Lamb (H.). **The honeybee in relation to the overwintering and primary spread of the fire-blight organism.**—*Phytopathology*, xxiv, 12, pp. 1347–1357, 1934.

A tabulated account is given of experiments under controlled conditions in Ohio in 1932–3 to determine the role of honey bees in the overwintering and primary spread of *Bacillus amylovorus* [*R.A.M.*, xiv, p. 221]. The Yellow Transparent and Grimes Golden Apple varieties were used in the tests.

Though the bees were found to carry the bacteria from artificially inoculated blossom clusters on the lowest branches to others on the same tree, they did not cause blossom infection when hives that had been infested with virulent cultures of the organism were placed under apple trees enclosed within cheese-cloth cages. The transfer of bee colonies, after exposure to heavy infection, from one locality to another did not communicate the disease. The longevity of *B. amylovorus* in pure honey was found to range from 5 to 11 days, but the organism could not be detected on the combs, frames, or in the honey in a beehive 24 hours after inoculation, while it was apparently only present for two days in bees taken from an infested hive. Under local conditions, therefore, the beehive does not seem to constitute a likely source of fireblight inoculum in the spring.

Blight proof Pear trees are uniform.—*Bett. Fruit*, xxix, 6, p. 1934.

In the autumn of 1934 there was planted in southern Oregon a block of 500 young pear trees which is believed to approach more nearly to absolute uniformity and to be more resistant to fireblight [*Bacillus amylovorus*] than any other lot of pear trees in existence. All the stocks were grown from seed from a single tree, fertilized with pollen from one other selected tree, the 500 seedlings grown being selected for uniformity from 2,000 produced. These stocks are from the Old Home variety, the most resistant named variety making vigorous enough growth for experimental purposes. When the main branches have become established the trees will be top-worked to the kind of fruiting varieties desired, such as Bartlett, Anjou, and Bosc. Control of fireblight can then be confined to the bearing wood, with no danger of losing the tree itself.

Cation (D.). **Peach mosaic.**—*Phytopathology*, xxiv, 12, pp. 1380–1381, 1934.

Peach branches received from Colorado in July, 1932, for comparison with the red suture disease occurring in Michigan [*R.A.M.*, xiv, p. 219]

showed no obvious resemblance to the disorder in question. Buds were grafted into a young Hale peach tree at East Lansing, and though all were dead by the close of the season, in the following spring the inoculated tree showed the foliar crinkling and mottling described as characteristic of mosaic [ibid., xiv, p. 222], the symptoms being particularly marked in the leaves developing during a cold spell between 12th and 18th June. Three seedling trees grafted in August, 1933, with buds from the artificially infected Hale and transferred in December to a greenhouse kept at a temperature above 75° F. manifested no mosaic symptoms under these conditions, but the disease developed when the trees were removed to cooler situations. In May, 1934, these trees were placed outside the greenhouse, and again the leaves formed during cool periods showed mosaic symptoms which were not apparent in warm weather. All the other trees inoculated with buds at the same time as the foregoing and left in the field contracted the disease, which thus appears to find maximum expression at a low temperature range.

Dunegan (J. C.). **The susceptibility of the peach to artificial inoculations with Bacterium syringae and some allied organisms.**—*Phytopathology*, xxiv, 12, pp. 1378–1379, 1934.

Between 1932 and 1934 the writer conducted inoculation experiments under controlled conditions at the Arkansas Agricultural Experiment Station to determine the pathogenicity to the peach of seven bacterial plant pathogens, namely, two strains of *Bacterium* [*Pseudomonas*] *syringae* from lilac [*R.A.M.*, xiii, pp. 288, 452, 748] isolated, respectively, in Holland and the United States, *Bact.* [*P.*] *prunicola* and *Bact.* [*P.*] *mors-prunorum* from plum (England) [ibid., xiii, pp. 452, 710], *Bact.* [*P.*] *papulans* from Stayman apples (Arkansas), *Bact.* sp. causing target canker of Delicious apples (Virginia) [ibid., xiii, p. 384], and a *Bacterium* found to be the cause of a leaf spot of Italian prunes in Arkansas. Positive results were obtained in every case where aqueous suspensions of the organisms were actually introduced by a hypodermic needle into the leaf and twig tissues, the chloroplasts of which were markedly affected while anthocyanin pigment formation in the adjacent regions was stimulated.

Isaac (W. E.). **Researches on the chlorosis of deciduous fruit trees. I. Preliminary. II. Experiments on chlorosis of Peach trees.**—*Trans. roy. Soc. S. Afr.*, xxii, 3, pp. 171–204, 1934.

In the first of these two papers the author gives a brief review of the work hitherto done on the causation of chlorosis in plants, with particular reference to previous studies of the condition in deciduous fruit trees in South Africa [cf. *R.A.M.*, xi, p. 724].

The second contains an account of preliminary experiments which were carried out in 1933–4 on Krom River Farm, Elgin, in a plantation of 3,000 young peach trees established in 1933, about 500 of which soon began to exhibit serious chlorosis, the chlorotic trees being mostly but not exclusively grouped together. The results indicated that the condition was curable by soil applications of copper sulphate at doses sufficient to give about 20 p.p.m. of copper in the soil, and also that

applications of potassium sulphate at the rate of 112 lb. per acre, equivalent to about 54 lb. of K_2O, effected a definite improvement. While the condition of the affected peach trees suggests that at least two distinct sets of injurious factors are operative in the soil, the fact that their unhealthy condition was aggravated by applications of lime would indicate that they are not suffering from excess of available aluminium, iron, or manganese. There was no evidence of a deficiency of manganese or magnesium.

TRIFONOVA (VERA). Червени петна по Сливата—**Polystigma rubrum (Pers.) DC.** [The red spot disease of the Plum—*Polystigma rubrum* (Pers.) DC.]—*J. agric. Exp. Sta. Bulg.*, Sofia, v, 11–12, pp. 3–49, 13 figs., 1933. [English summary. Received February, 1935.]

This is the full report of the author's investigation of the red spot disease of plums (*Polystigma rubrum*) in Bulgaria, a comprehensive account of which has already been noticed from another source [*R.A.M.*, xiii, p. 453].

GOIDÀNICH (G.). **Ricerche sul 'deperimento' dei Susini.** [Researches on the Plum 'wilt'.]—*Boll. Staz. Pat. veg., Roma*, N.S., xiv, 3, pp. 339–381, 22 figs., 1934. [English summary.]

A full account is given of further investigations into the wilt (now termed 'non-parasitic leptonecrosis') of Burbank and S. Rosa plum trees recently reported from Italy [*R.A.M.*, xii, p. 769]. In the chronic form of the disease only the middle layers of the phloem are affected during spring and summer, but in the autumn the discoloration almost reaches the cambium; when cambial activity is resumed in the following year new phloem is formed which is only slightly affected. The discoloration may involve a part or the whole circumference of the limb. In fatal termination the necrosis extends through the cambium into the wood. In the acute (and more usual) form conditions are set up in the tree which result in the sudden death of all the aerial organs instead of a single branch, as in the chronic form. The progress of the disease falls into two stages, the first of which shows itself externally as a chlorosis and rolling-up of the leaves and internally as phloem necrosis, while the second (and fatal) stage starts when the wood becomes affected and the leaves wither and die.

A section through the phloem of an affected tree shows that the sieve-tubes, companion cells, and phloem parenchyma are at first rusty-red and later turn black, the discoloration affecting both the cell walls and contents, and being most conspicuous where the cells have become compressed. The medullary rays remain normal, accumulating a considerable quantity of starch. The cambium consists of a few layers of meristematic cells, the transition of which into sieve-tubes takes place immediately. Callus forms very rapidly, sections made in June showing it already present even in unaffected sieve-tube layers near the cambium. The chlorotic leaves contain an excess of starch.

These symptoms indicate some interference with the descending circulatory apparatus affecting the phloem and producing leptonecrosis, the first and most important pathological characteristic of the condition;

this causes the wood to become affected in turn. The phloem necrosis is probably due to a gummy degeneration extending to the cell walls and contents. The discoloration of the wood is accompanied by abundant gum formation which occludes the vessels; that this gum is insoluble in water accounts for the fact that when the active parts of the xylem become affected the leaves wilt.

The condition is provisionally attributed to incompatibility between stock (*Prunus myrobolana* L.) and scion.

Donen (I.). **Studies in deciduous fruit. I. The effect of time of picking on the keeping quality of Plums, with especial reference to the internal browning of the Kelsey Plum.**—*Trans. roy. Soc. S. Afr.*, xxii, 4, pp. 297–311, 1 pl., 2 graphs, 1934.

An account is given of experiments in which Gaviota and Kelsey plums picked at various stages of maturity in four orchards in South Africa, differing in soil, climate, and cultural treatment, were kept in cool storage (34° to 36° F.) for thirty days and subsequently at room temperature for four or twelve days. The results showed that the Gaviota plums that had been picked early developed the least amount of breakdown after storage; this variety should not, however, be kept in store over thirty days, as longer keeping considerably increased the percentage of breakdown. Early-picked Kelsey plums failed to colour in store and showed a high percentage of breakdown, two types of which are distinguished in this variety, namely, internal and invasive browning. The first is characterized by the development of a brown discoloration of the parenchyma immediately around the stone, which slowly spreads outwards until about 75 per cent. of the flesh becomes dark brown, the vascular tissue remaining white and unaffected; this condition is associated with an internal collapse of the flesh, leading, in the worst cases, to a shrivelling of the whole plum. In the second type the browning first appeared as a narrow zone of brown tissue in the flesh near the skin and progressed inward.

All the Kelsey plums, irrespective of time of picking, finally showed internal browning when kept in store for 80 days. It is suggested that this variety should not be stored for periods much over 30 days, and that fruit for export should be picked with 5 to 8 per cent. of coloured surface.

Tomkins (R. G.). **Iodized wraps for the prevention of rotting of fruit.**—*J. Pomol.*, xii, 4, pp. 311–320, 1934.

In tests [which are described and the results of which are tabulated] with iodized paper wrappers for the control of fruit storage rots, wounded oranges inoculated with the spores of *Penicillium digitatum* were wrapped in plain tissue paper or tissue paper treated with a solution of 12·7 gm. iodine, 10 gm. potassium iodide, 200 c.c. water, and 800 c.c. rectified spirit; sheets 50 by 75 cm. readily absorbed 15 c.c. of the solution, this amount being equivalent to 30 mg. of free iodine per wrap 25 cm. square. After 28 days' storage at different temperatures between 5° and 25° C. the samples in the plain and treated wrappers showed, respectively, 5 to 10 and 30 to 55 per cent. sound fruit. When comparable samples of wounded, inoculated oranges were placed in

storage in wrappers impregnated with different amounts of iodine and potassium iodide, the best results were given by the paper treated with 1 per cent. potassium iodide and 1 to 2 per cent. iodine, i.e., that containing approximately 25 to 50 mg. of free iodine per wrap.

Grapes and tomatoes stored in iodized paper wrappers remained free from storage rots and fungal growths for longer periods than when wrapped in untreated paper; thus, Spanish green grapes stored in plain paper wrappers at 42°, 32°, 25°, 18°, and 10° were, respectively, 3, 4, 4, 8, and 30 days in storage before mould growth appeared, whereas the corresponding figures for those in the treated wrappers were 6, 14, 15, 30, and 40 days. After 54 days in storage at 15°, 10°, and 5° green tomatoes in the plain wrappers showed 80, 90, and 100 per cent. rotted fruits, as compared with 20, 0, and 0 per cent. for those in the treated wrappers. The appearance and flavour of the grapes and tomatoes in the treated wrappers remained unimpaired. With apples, plums, and peaches the treated wrappers reduced the amount of rotting, but the treatment adversely affected the appearance and ripening of some varieties.

Smart (Helen F.). **Micro-organisms surviving the storage period of frozen-pack fruits and vegetables.**—*Phytopathology*, xxiv, 12, pp. 1319–1331, 1934.

Out of some 10,000 containers of frozen fruit and vegetables from three important packing centres in the United States, some 3,000 were subjected from 1929 to 1934 to microbiological analysis for bacteria, yeasts, and moulds, while all were superficially examined for appearance, consistency, flavour, and the like [cf. *R.A.M.*, xiii, p. 796]. Species of the following genera of moulds survived one to three years' storage in sealed containers at 15° F.: *Aspergillus*, *Cladosporium*, *Dematium*, *Oidium*, *Monilia*, *Penicillium*, and *Rhizopus*. Blackberries, figs, and red currants showed a strikingly low incidence of spoilage (average 50 micro-organisms per gm.) as compared, for instance, with cherries (2,250). After a year at 15° the frozen-pack vegetables examined showed a very high microbial content, exceeding 1,000,000 per gm. in some lots of Lima beans [*Phaseolus lunatus*], peas, and spinach (no moulds in the last named). Species of *Penicillium* were extensively represented in beets, Lima beans, mushrooms, and peas; *Rhizopus* in maize and tomatoes; *Aspergillus* in mushrooms and peas; *Cladosporium*, *Dematium*, and *Monilia* in Lima beans; and *Mucor* and a species of *Trichoderma* in mushrooms.

Wardlaw (C. W.). **Diseases of the Banana and of the Manila Hemp plant.**—x+615 pp., 2 col. pl., 280 figs., 15 graphs, London, Macmillan & Co., Ltd., 1935.

In this well-produced and carefully edited book, copiously illustrated with excellent photographic and line or half-tone figures, many of which are original or from his own previously published illustrations, the author has dealt with the chief diseases of banana and the related abacá or Manila hemp (*Musa textilis*) on a scale comparable to that followed in Fawcett's and Lee's classical book on 'Citrus Diseases'. It is, indeed,

probably the most complete work on the diseases of a single tropical crop that has hitherto been attempted, while the range of types of plant diseases covered and the fullness of their treatment will make it a welcome addition to the library of all phytopathologists.

The diseases are grouped under four main headings, viz., (1) soil-borne, vascular, and stem (with three chapters on the wilt or Panama disease of bananas caused by *Fusarium oxysporum cubense*), (2) plantation diseases of the fruit and leaf, (3) virus diseases, and (4) storage disorders of the fruit. The whole subject is considered in the light of the most recent researches and the information presented may be regarded as virtually up to date. Both the technical and purely practical aspects of banana cultivation in relation to disease are very fully treated, so that the requirements of scientists and planters are alike amply covered. There are four appendices, namely, (1) a list of bacteria and fungi associated with the banana as saprophytes and parasites (with synonyms); (2) notes on a cultural and morphological study of six strains of *F. oxysporum cubense*; (3) statistics relating to the importation of bananas into Great Britain; and (4) conditions on shipboard [*R.A.M.*, xii, p. 104]; followed by a most comprehensive bibliography of 559 titles and index.

Reyes (G. M.). **Banana black-tip disease in the Philippines.**—*Philipp. J. Agric.*, v, 2, pp. 117–119, 1 pl., 1934.

Attention is drawn to the occurrence on unripe Latundan (or Tordan) bananas in the Philippines of the typical symptoms of the black tip disease due to a fungus agreeing in all respects with *Helminthosporium torulosum* [see above, p. 312].

Chaudhuri (H.) & Singh (J.). **Une nouvelle maladie du Grenadier (Punica granatum Linn.).** [A new disease of the Pomegranate (*Punica granatum* Linn.).]—*Bull. Soc. mycol. Fr.*, l, 2, pp. 153–161, 1 pl., 1934.

A brief morphological and cultural account is given of an apparently hitherto undescribed fungus, which was experimentally proved to be the cause of a serious pomegranate disease in the Punjab and North-Western Frontier Province of India. Infection results in a severe die-back of the shoots, the dead and underlying parts of which bear small black pycnidia on their surface; these pycnidia were never found on the fruits on affected trees. The organism is referred to the genus *Pleuroplaconema* established by Petrak in 1923 (*Ann. mycol.*, xxi, p. 300), and is named *P. punicae* n.sp. The hyphae are continuous when young, branched, and 2 μ broad. The pycnidia are formed abundantly both on the natural and on synthetic substrata, and are either carbonaceous or membranaceous according to the medium; they are globular or flask-shaped, and very variable in size (100 to 1,300 μ in culture). The pycnospores are hyaline, unicellular, straight or slightly bent, usually borne singly at the end of branched conidiophores; they measure from 3·48 to 6·33 by 0·63 to 1·9 μ (average 4·42 by 1·26 μ) but may attain 7·02 by 2·03 μ in certain media. Sclerotia are readily formed on maize starch agar and in Richards's medium.

Petroff (A. D.). Химические свойства и методы анализа инсекто-фунгисидов. [Chemical properties of insecto-fungicides and methods for their analysis.]—128 pp., 11 figs., Госхимтехиздат. [State Chem. Tech. Publ. Office], Leningrad, 1933. [Received February, 1935.]

This small and somewhat elementary text-book is stated to have been compiled for the use of students of practical phytopathology in the U.S.S.R., and gives a brief account of the main chemical properties and chemical constitution of the more common insecticides and fungicides [excluding mercurials] now employed in the Union; it also briefly describes certain methods for the rapid analysis of the preparations and for the estimation of their efficacy.

Faes (H.), Staehelin (M.), & Bovey (P.). **Les ennemis des plantes cultivées. Champignons parasites, insectes nuisibles, accidents, moyens de lutte.** [The enemies of cultivated plants. Parasitic fungi, noxious insects, injuries, control measures.]—381 pp., 4 col. pl., 242 figs., Lausanne, Librairie Payot & Cie., 1934.

This is stated to be the fourth edition of the manual under review, which has been compiled by the well-known Director of the Federal Viticultural and Arboricultural Experiment Station at Lausanne with the aid of two scientific experts on his staff. It is published under the official auspices of the Swiss Association of Agricultural Professors and destined for the use of agricultural students and practicians. The book, which is clearly and copiously illustrated, is divided into two parts, the first dealing briefly and in general terms with the problem of pathogenic invasion (in outline only), parasitic diseases caused by insects and fungi, the control of these organisms, and non-parasitic maladies; and the second and larger portion comprising sections on physiological disturbances, pests, and diseases of the vine and other fruits, and of agricultural and kitchen-garden plants.

Morstatt (H.). **Bibliographie der Pflanzenschutzliteratur: das Jahr 1933.** [Bibliography of plant protection literature for the year 1933.]—*Biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, 316 pp., 1934.

This bibliography of German and foreign literature published during 1933 on various branches of phytopathology has been compiled on the usual lines [*R.A.M.*, xii, p. 775].

Siemaszko (W.). **Zagadnienie sasięgów geograficznych chorób roślin uprawnych.** [The problem of the geographical distribution of the diseases of economic plants.]—*Roczn. Nauk ogrodn.* [*Ann. hort. Sci.*], Warsaw, i, pp. 163–170, 1934. [English summary.]

This brief note represents an attempt by the author to determine, from the data scattered in literature, some of the factors (chiefly climatic) which limit the geographical spread of the parasitic diseases of cultivated plants. As good examples of the controlling effect of the climate on the establishment of a disease newly imported into a country, reference is made to the outbreak in 1927 of potato late blight (*Phytophthora infestans*) and downy mildew of the vine (*Plasmopara viticola*) in

Manitoba, Canada, no further records of which have since been made there. Certain parasites are more or less strictly confined to definite climatic zones, as, for instance, the Peronosporaceae, which appear to be prevalent in regions with an oceanic climate, while the Erysiphaceae seem to prefer continental climates. This may perhaps also explain the striking fact that certain diseases which attack the host plants in the home of their origin, e.g., the potato rusts (*Aecidium cantensis* and *Puccinia pittieriana*) [*R.A.M.*, xi, p. 226] which are very prevalent in South America, have not followed their hosts into their new countries of cultivation.

List of common names of British plant diseases.—95 pp., Cambridge University Press, 1934.

The present revised list of common names of British plant diseases [cf. *R.A.M.*, viii, p. 517] contains seven new hosts and some fifty additional diseases. A number of alterations have been made in the scientific names of the relevant pathogens with a view to securing accuracy and conformity with the International Rules of Botanical Nomenclature. Species of *Fusarium* have been named in accordance with Wollenweber's *Fusarium* Monograph as far as published [ibid., x, p. 626]. Pending the decisions of the International Society for Microbiology, no substantial changes have been made in the names of the bacterial pathogens comprised in the list. The difficulties presented by the inclusion of the common names of tree diseases and their agents have not yet been overcome.

Report on the Third Imperial Mycological Conference, 1934.—32 pp., Imperial Mycological Institute, Kew, Surrey, 1934.

The following were the principal subjects of discussion at the Third Imperial Mycological Conference held in London in September, 1934: work and organization of the Imperial Mycological Institute; administrative measures (including legislation) against plant diseases; methods of standardization of insecticides and fungicides; virus diseases of plants; simplification of control measures for use by small cultivators; foot rot of cereals; and breeding and selection for immunity against disease. Shorter papers were read on the control of turf diseases, effects of drought on potatoes, co-ordination of mycological work in the Empire, root rots of rubber, brown heart of swedes [*R.A.M.*, xiv, p. 70], gumming disease of sugar-cane [*Bacterium vascularum*], and citrus and cotton diseases.

Among the resolutions adopted by the Conference were (1) a proposal for the acceptance throughout the British Empire of a uniform health certificate (the terms of which are defined) to accompany plant exchanges and imports, without prejudice to the rights of importing countries in respect of the prohibition, quarantining, inspection, or treatment of such products as they may deem fit; (2) a recommendation that the transport of living plants by air passengers be prohibited; and (3) the regular circulation by Empire Governments of memoranda regarding current changes in plant protection legislation and the regulations issued thereunder.

Proctor (B. E.). **The microbiology of the upper air. I.**—*Proc. Amer. Acad. Arts Sci.*, lxix, 8, pp. 315–340, 6 figs., 1934.

A detailed, tabulated account is given of the results of 45 aeroplane flights made since 1932 near Boston, Massachusetts, with the object of examining the microflora of the upper air by means of a specially devised collecting apparatus [which is fully described]. The maximum level reached was 20,600 ft.; bacteria and moulds were found above 19,600 and yeasts above 16,000 ft. The examination of 128 mould cultures showed that 57 were species of *Aspergillus*, while 36 belonged to *Penicillium* [cf. *R.A.M.*, xii, p. 371]. Above 9,000 ft. the average number of dust particles captured per exposure was 170·8, the corresponding figures for bacteria and moulds being 1·25 and 0·2, respectively. The length of each exposure varied in different flights from 10 to 35 minutes, the average rate of passage of air through the collector being approximately 1 cu. ft. per minute under general flight conditions.

Petersen (H. E.). **Studies on a parasitic fungus in the Eelgrass, Zostera marina L.**—*Bot. Tidsskr.*, xliii, 1, pp. 1–9, 13 figs., 1934.

The author gives a description of the organism, a species of *Ophiobolus*, which he has found constantly associated with the wasting disease of *Zostera marina* in Danish waters and believes to be the cause of the trouble [*R.A.M.*, xiii, p. 317]. Perithecia form in the late winter to early spring, sometimes also during the summer; they are globular or piriform, $\frac{1}{5}$ to $\frac{1}{4}$ mm. in width, bluish-black, and situated immediately below the epidermis of the host rhizomes. The perithecia contain filiform, acute-ended, non-septate ascospores, about 250 by 2 to 3 μ, formed in non-persistent asci. Leaf infection occurs in the spring by means of the ascospores liberated from the perithecia. The fungus is readily obtainable in pure culture (*Zostera* agar) from the rhizomes, but has only once been isolated from the leaves. It grows somewhat slowly, forming a dense, grey, later reddish-brown mycelial mat, which when placed with a portion of the agar substratum in sea water gives a luxuriant growth in which the formation of perithecia may be initiated. Inoculation tests with mycelial fragments on *Zostera* leaves gave positive results on a limited scale.

The wasting disease has been reported, in Scandinavian waters, from Norway, the Kattegat coasts of Sweden and Denmark, the Limfjord, and the Belts [ibid., xiii, p. 793].

Manil (P.). **De la différenciacion de certains virus phytopathogènes par l'action des complexes.** [On the differentiation of certain phytopathogenic viruses by the action of complexes.]—*C. R. Soc. Biol. Paris*, cxviii, 4, pp. 376–379, 1935.

On 21st January, 1934, the writer inoculated under controlled conditions at Gembloux, Belgium, three young tobacco plants with ordinary tobacco mosaic of local origin [*R.A.M.*, xiv, p. 185], herein referred to as M; three with the mosaic produced in tobacco by inoculation with the juice of 'crinkled' Industrie potatoes (M′) [cf. ibid., xiv, p. 199]; three with K. M. Smith's potato X virus; three with the complex M+X; and three with the complex M′+X, a further three being left

untreated. On 8th March the symptoms presented by the M and M′ series were identical, and they remained so till the close of the experiments in May, with the possible exception of a slight folding of the upper leaves of M′. Two plants of the X series showed a well-defined ring spot, the third remaining healthy. Both M+X and M′+X were affected by mosaic and foliar necrosis in a similar manner, except that in the latter series the mottling was more diffuse and stunting more pronounced (height 5 cm. compared with 6 for M+X and 16 for the controls). On 5th April the comparable figures were 5·5, 10·5, and 27 cm., respectively, and the upper leaves of M′+X were excessively reduced in size. On 5th May the three M′+X plants were dead, while those of the M+X series were healthy and stood 24 to 27 cm. in height. Confirmatory tests were carried out in April with the two complexes with results similar to the foregoing.

It is apparent from these data that the same alien virus (potato X), incorporated with two apparently homogeneous tobacco mosaics, can bring to light far-reaching distinctions between the latter.

Gratia (A.) & Manil (P.). **De quelques échecs de la méthode sérologique appliquée aux virus des plantes.** [On some failures of the serological method applied to plant viruses.]—*C. R. Soc. Biol. Paris*, cxviii, 4, pp. 379–381, 1935.

The writers have as yet been unsuccessful in their attempts to extend the serological method, found effective in the differentiation of tobacco and potato mosaic viruses (X) [see preceding abstract], to the agents of other disorders of known or suspected virus origin, such as those of beet yellowing and mosaic [*R.A.M.*, xiv, p. 72] and the potato leaf roll and virus Y. As regards the question of beet mosaic, this negative outcome would appear to support the view that more than one virus, with divergent antigenic properties, is implicated. In the case of *Melilotus* mosaic [ibid., ix, p. 120; xiii, p. 489], the anti-mosaic serum flocculates indiscriminately mosaic and healthy *Melilotus* and healthy lucerne, so that here again the results are useless from the differential standpoint.

Harley (J. L.). **Some critical experiments upon culture methods used for fungi.**—*New Phytol.*, xxxiii, 5, pp. 372–385, 11 graphs, 1934.

As a result of his cultural experiments with *Neocosmospora vasinfecta* (as representing the group of fungi in which the direction and extent of the change in the P_H value of the substratum caused by growth depends mainly on the nitrogen source) and *Sclerotinia sclerotiorum* (as representing the group in which the change is always towards the acid side and the extent alone of the change depends on the nitrogen source), the author emphasizes the limitations in the technique as used at present in the culture of fungi, due to the effect on the culture medium of the absorption and release of substances by the fungus during its growth. The changes thus brought about are illustrated in respect of the hydrogen-ion concentration with its effect on the composition of the medium.

Attention is also called to the influence of the substances present in

agar, to the effect of heat sterilization, and to the uncontrolled aeration, as invalidating agencies in chemical work in the physiology of fungi.

LUCHETTI (G.). **Comment se comporte le 'Geotrichum javanense, Ver.' dans le lait?** [How does *Geotrichum javanense* Ver. behave in milk?] —*Boll. Sez. ital. Soc. int. Microbiol.*, vi, 12, pp. 490–491, 1934.

After referring to Verona's isolation from a Javanese form of yoghourt of *Geotrichum javanense* Ver. as well as *Bacterium bulgaricum* and *Streptococcus lacticus*, the author states that his investigations demonstrated that the production of alcohol in the beverage was due mainly to the first-named organism and only secondarily to *Bact. bulgaricum*.

DIX (W.). **Ein Beitrag zur Frage des Abbaues der Kartoffel.** [A contribution to the problem of degeneration in the Potato.]—*Landw. Jb.*, lxxx, 5, pp. 769–809, 3 figs., 1934.

A comprehensive, fully tabulated account is given of the writer's experimental studies at the Kiel Agricultural and Plant Breeding Institute on various forms of potato degeneration, from which the conclusion is drawn that these phenomena are due to alcohol formation in the tubers with consequent respiratory disturbance and not, at any rate in the first place, to virus infection [*R.A.M.*, xiv, p. 54].

GIGANTE (R.). **Un caso di elevata recettività per le malattie da virus presentato da piante di Patata provenienti da riproduzione sessuale.** [A case of high susceptibility to virus diseases shown by Potato plants obtained through sexual reproduction.]—*Boll. Staz. Pat. veg., Roma*, N.S., xiv, 3, pp. 334–338, 1934. [English summary.]

In an experimental plot in northern Italy in which, in an attempt to obtain lines resistant to degeneration diseases, imported potatoes had for some years been grown on from true seed, nearly all the plants were affected with leaf roll, crinkle, or various forms of mosaic and necrosis; in another, where asexual reproduction had been practised and tuber selection with the Bianca di Como variety carefully carried out, all diseased plants being systematically removed and burnt, the great majority of the plants were extremely healthy and vigorous, very slight leaf roll but no other virus disease being present. This is considered to show that potatoes sexually reproduced may be highly susceptible to degeneration diseases, and to indicate also that varieties widely grown in Italy for some years may possess inherent resistance, a view supported by the fact that even before selection was practised such varieties long remained practically unaffected. The author suggests that the Bianca di Como variety is congenitally resistant to virus attack, and concludes that the most practical method of combating potato degeneration diseases consists in the preservation and improvement by means of careful tuber selection of the existing resistant varieties.

BAWDEN (F. C.). **Studies on a virus causing foliar necrosis of the Potato.** —*Proc. roy. Soc.*, Ser. B, cxvi, B799, pp. 375–395, 2 pl., 1934.

This is a detailed account of the author's studies of a potato virus (first obtained in 1927 from Murphy under the designation of 'President streak') which is considered not to have been described hitherto, and

for which the provisional name of potato virus 'D' is suggested. In certain varieties (e.g., Arran Chief, Arran Comrade, Arran Victory, British Queen, Edzell Blue, Kerr's Pink, and Sharpe's Express) it produces, when inoculated either by needle or by stem graft, a foliar necrosis, characterized by the appearance 17 to 19 days after inoculation of greyish, soft, and damp interveinal necrotic blotches on the under surfaces of the leaves, giving the latter a wilted aspect; the necroses spread rapidly, coalesce, and ultimately involve the whole leaf, which then falls. The disease advances acropetally in the plant, the severity and extent of the symptoms depending somewhat on environmental conditions and the stage of growth of the host, the growing points of which are never killed. These systemic symptoms are frequently preceded by extremely localized local lesions at the seat of needle inoculations, especially when inoculation is carried out in such a manner that the leaf hairs are broken without materially injuring the epidermis; these lesions appear externally as black necrotic spots penetrating the thickness of the leaf, and are more or less circular, brittle to the touch, and after a time tend to fall out.

The primary symptoms are later followed by a secondary and less severe stage, in which the upper leaves show a pronounced and rather blotchy interveinal mosaic, together with spotty interveinal necroses which may cause acute local deformity; these necroses are hard, black, and brittle, show little tendency to coalesce and remain as isolated patches of dead cells penetrating the thickness of the leaf. In this stage the leaves do not wilt and fall, and any new growth shows only interveinal mottle and the scattered black necroses. Tubers from plants affected with potato virus 'D' are small but apparently healthy and sprout normally; the plants produced by them show symptoms very similar to those of first year infected plants in the secondary stage of the disease; they are much smaller than healthy ones, mature earlier, without any wilting or falling of the foliage, and set only a few small tubers.

Histological examination of leaves of Arran Victory with foliar necroses showed that the necrotic process originates in the parenchymatous cells abutting on the small vascular bundles between the main veins. These cells swell, their cytoplasm becomes abnormally granular and yellow, whilst the walls are thickened by deposits of suberin or cutin; the plastids rapidly degenerate, their breakdown often being the first obvious sign of disease. No intracellular inclusions or 'X' bodies were seen in the large number of preparations studied.

In certain other potato varieties such as, for instance, Duke of York, Epicure, King Edward, Majestic, and Up-to-Date, potato virus 'D' causes top necrosis [acronecrosis: *R.A.M.*, xi, p. 741], while some varieties such as Champion, Di Vernon, and Eclipse were shown to be carriers of the virus; Great Scot and International Kidney may also act as carriers, but their reaction is not constant. The virus was successfully inoculated into tobacco, tomato, *Datura stramonium*, and *Nicotiana glutinosa*, the symptoms on which are briefly described. No insect vector of the virus has as yet been determined.

The paper also contains an account of the purification and of certain of the properties of potato virus 'D' *in vitro*. It is filterable through a

Chamberland L5 candle, is destroyed by heating for 10 minutes at 68° C., withstands ageing in expressed sap for 5 days at 25° and for one week at 1°, is inactivated by 60 per cent. ethyl alcohol, 4 per cent. phenol, and 4 per cent. formalin, all acting for one hour, and is infective at a dilution varying from 1 in 1,000 to 1 in 5,000, according to the species and age of the host plant.

Plants infected with virus 'D' acquire resistance to further infection with potato virus 'X', and vice versa, the extent of the immunity thus acquired depending somewhat on the species and on the rapidity of growth of the host plant. A brief discussion is appended of the possible reasons underlying this acquired resistance, and it is suggested that the two viruses 'X' and 'D' have similar physiological requirements, so that both find it difficult to multiply in the same cell.

Dorojkin (N. D.). Ликвидируем порошистую паршу Картофеля. [Eliminate the powdery scab of Potatoes.]—*На Защиту Урожая* [*Crop Protection*], Moscow, *1934*, 4, pp. 11–12, 1934.

The author states that powdery scab of potatoes [*Spongospora subterranea*] is slowly extending throughout the U.S.S.R., where the disease was previously restricted to comparatively few, widely separated infection foci. Experiments in 1931 and 1933 in White Russia (where powdery scab is stated to be more or less endemic) disproved the prevalent view in Russia of the relative harmlessness of the disease, inasmuch as they showed that potato tubers affected with it are much more liable than healthy ones to various storage rots. Excellent control of powdery scab, common scab [*Actinomyces scabies*], and the storage rots was obtained by disinfecting potato seed tubers in the autumn with meranin (a liquid organic mercury preparation containing less mercury than mercuric chloride but claimed to be considerably more efficacious than the latter), the treatment consisting in dipping the tubers in a 1 in 2,000 meranin solution for 20 to 30 minutes. The treatment did not reduce the viability of tubers which were dipped when sprouted.

Salaman (R. N.) & O'Connor (Cecilia). **A new Potato epidemic in Great Britain.**—*Nature, Lond.*, cxxxiv, 3398, p. 932, 2 figs., 1934.

Early blight of potatoes (*Alternaria solani*), hitherto of relatively slight importance in Great Britain, was observed in 1932, and still more in 1933, to be assuming an epidemic form in the greenhouse and field at Cambridge. In 1934 inoculation experiments were carried out on a large scale both under glass and in the open with positive results. The Kerr's Pink and (to a lesser extent) Edzell Blue varieties were also found in 1934 to be infected by *A. solani* in the potato-growing areas of Ross, Cromarty, and Aberdeen, the north-west coastlands, and the Outer Hebrides: Golden Wonder being apparently immune. In the late autumn of the same year the Majestic and King Edward varieties suffered severely at Cambridge. No evidence was forthcoming of direct injury to the tubers from the attacks of the early blight fungus, but obviously the photosynthetic process must be sensibly impaired by a 25 per cent. reduction in the green leaf area.

Tullis (E. C.). **Leaf smut of Rice in the United States.**—*Phytopathology*, xxiv, 12, p. 1386, 1934.

Leaf smut of rice (*Entyloma oryzae*) [*R.A.M.*, xiii, p. 416], first reported from the Philippines, has been found in the lower Mississippi Valley. The fungus has recently been cultured in Japan by S. Ito and collaborators from leaf spots formerly attributed to *Sclerotium phyllachoroides* and *Ectostroma oryzae* [ibid., xi, p. 801, where it is incorrectly given as '*Entostroma*']. Specimens of the disease from Japan were found by the writer to be identical with the small, black leaf spot of rice in America, the older lesions of which contained chlamydospores corresponding in all essentials with those of *Entyloma oryzae* as originally described.

Tullis (E. C.). **Trichoderma sheath spot of Rice.**—*Phytopathology*, xxxiv, 12, pp. 1374–1377, 2 figs., 1934.

A hitherto undescribed sheath spot of rice has been observed since 1929 in Louisiana, Texas, and (more recently) in Arkansas. The lesions, which first appear on the sheaths at about the water line in mid-July, are reddish-brown and measure 2 to 3 by 1 mm.; later they enlarge considerably (up to 10 cm.) and become paler (cream-coloured) towards the centre. Occasionally a definite stripe may develop from the base to the tip of the leaf, apparently in continuation of the sheath infection. The most susceptible varieties (in the order named) are Vintula, Carolina Gold, C.I. 2971, Fortuna, Rexoro, and Blue Rose; as a group, the short-grain varieties show very fair resistance to the new disease, the agent of which is tentatively referred to *Trichoderma lignorum*. Positive results were given in a limited number of greenhouse inoculation tests with the fungus on the Supreme Blue Rose and Carolina Gold varieties. The mycelium occupies the cells and air spaces of the parenchyma of the infected areas and extends into the tracheal tissues.

Beeley (F.). **Oidium heveae. Report on the 1934 outbreak of Hevea leaf mildew.**—*J. Rubb. Res. Inst. Malaya*, v, 4, pp. 342-350, 1 graph, 1934.

The author gives notes on the occurrence of *Hevea* rubber mildew (*Oidium heveae*) [*R.A.M.*, xiii, pp. 181, 470, 727] during the first five months of 1934 in Malaya. Excessive rains throughout the country in January and February delayed the commencement of wintering, which was slowed up in a very irregular manner by dull, wet weather in March and April, the lack of sunshine also causing the new leaves to remain limp and susceptible for a long time. The growth and spread of the fungus were favoured by the increased humidity, and a mild amount of leaf fall occurred in practically every locality, in many districts for the first time, the chief effect of the fungus hitherto having been exerted on the inflorescence [ibid., xiii, p. 181]. Owing to the inclement weather it was impossible to adhere strictly to the usual sulphur dusting programme, but on six estates the treatments given resulted in an average of 50 per cent. control. The dusted trees did not appear at the time of writing (July) to be likely to give any increase in yield as a result of the applications.

Arakawa (S.). **The influence of sugars on the cellulose decomposition by the soil fungi.**—*Trans. Tottori Soc. agric. Sci.*, v, 1, pp. 27–35, 3 figs., 1934. [Japanese, with English summary.]

The author tested the action on cellulose of various fungi isolated from soils and found that *Trichoderma koningi*, *Aspergillus cellulosae* [*R.A.M.*, xii, p. 593], and some other not fully identified fungi decomposed both filter-paper cellulose and hydrocellulose, while *A. fumigatus*, *A. oryzae*, *Cladosporium herbarum*, and two other species decomposed hydrocellulose only.

Xylose stimulated the decomposition of hydrocellulose by these fungi while glucose and saccharose had no effect. Filter-paper cellulose decomposition by *T. koningi* was stimulated by xylose, xylan, arabinose, glucose, saccharose, and soluble starch, especially the first named. On the other hand these sugars depressed the decomposition effected by *A. cellulosae* to an extent of 30 to 49 per cent. Rhamnose had no effect.

Evidently the process of decomposition is influenced by several factors, including the kind of cellulose, the species of fungi concerned, and the composition of the culture medium in sugars and the like.

Bell (A. F.). **Report of the Division of Entomology and Pathology.**—*Thirty-fourth Rep. Bur. Sug. Exp. Stas Qd*, pp. 50–72, 4 graphs, 1934.

This report for 1933–4 [cf. *R.A.M.*, xiii, p. 324] contains among others the following items of phytopathological interest. Of great practical importance in Queensland was the passage of an amendment to the Sugar Cane Prices Act requiring the publication every year in each mill district of a list of approved cane varieties and the payment of a penalty of ten shillings for the crushing of each ton of cane of any other variety [ibid., xiii, p. 727]. This should lead gradually to the elimination of disease-susceptible varieties.

Owing to success in the control of gumming disease [*Bacterium vascularum*], the most important cane disease in Queensland is now the chlorotic streak that attacks Badila [ibid., xiii, pp. 325, 654], causing 75 to 100 per cent. infection in numerous large areas. In field tests at Meerawa and Feluga, in the wet tropical belt, the yields of chlorotic streak-diseased and healthy Badila cane and of untreated diseased Badila cane and diseased Badila submitted to the warm-water treatment were compared. In the former test the average yields of four healthy and four diseased plots were, respectively, 33·95 and 27·87 tons per acre, representing a mean loss from disease of 17·9 per cent. In the latter test the average yields for the diseased treated and untreated plots were, respectively, 30·43 and 20·71 tons per acre, as against 31·99 tons for the control plots of healthy, untreated cane. The losses in the ratoon crops are as yet undetermined.

A dormant outbreak of *Bact. vascularum* in the Mulgrave area is regarded as serious because of the extreme susceptibility of the seedling S.J. 4, which is otherwise particularly suitable for the poorer soils of this district. In southern Queensland the situation as regards gumming is well in hand; as a result of trials in 1933, Co. 290, P.O.J. 2725, and, to a less extent, P.O.J. 2878 appear to be of outstanding resistance, and

satisfactory resistance was also shown by Co. 290 × S. C. 12/4, P.O.J. 2875 × H.Q. 409, and P.O.J. 2878 × H.Q. 409. The resistance of Q. 813 has been adopted as an approximate standard by comparison with which other varieties are accepted or rejected. On this basis, the resistance of P.O.J. 2722, 2725, 2875, and 2878 is highly satisfactory even under the most rigorous conditions, while P.O.J. 2883 is also satisfactory. The New Guinea canes of the Brandes collection [ibid., xi, p. 265] are unsatisfactory, the only gumming-resistant variety showing deficient vigour.

Leaf scald [*Bact. albilineans*: ibid., xiii, pp. 472, 653] was not much in evidence during the season. There was some evidence that any cross containing N.G. 24 as parent had an unduly large proportion of susceptible progeny.

Further tests again demonstrated the susceptibility of P.O.J. 2878 to downy mildew [*Sclerospora sacchari*: ibid., xii, p. 787; xiii, p. 324], while P.O.J. 2722 also appeared to be very highly susceptible.

Dwarf disease [loc. cit.] was confined to the Homebush area, secondary spread being limited to low-lying fields and parts of fields. Prolonged masking of symptoms was observed in plants from diseased setts of H.Q. 426 and Malagache. Attempts at control by the warm-water treatment of the setts were unsuccessful.

Evidence was obtained that Fiji disease may be spread by adult leafhoppers [*Perkinsiella saccharicida*: ibid., xii, p. 787] as well as by the nymphs, but no transmission resulted from insects fed on diseased canes in the adult stage only.

In the Bundaberg district (where in many fields sugar-cane has been grown for forty years without rotation) the crop growth of certain varieties, especially Q. 813 in the red volcanic soils of Woongarra, has for some time been limited by undetermined factors; preliminary, small-scale tests indicated that indefinable root rots must frequently be a limiting factor in these old lands.

Maire (R.). **Champignons africains de la mission Humbert (1928).** [African fungi of the Humbert expedition (1928).]—*Bull. Soc. bot. Fr.*, lxxxi, 7–8, pp. 644–646, 1934.

This annotated list of fungi collected by H. Humbert in Madagascar and equatorial Africa in 1928 includes, among other records, *Corynelia uberata* on living leaves of *Podocarpus madagascariensis* in Madagascar, *Colletomanginia paradoxa* [*Engleromyces goetzei*: *R.A.M.*, iii, p. 444] on living *Arundinaria alpina* in Belgian equatorial Africa, and *Aloysiella deformans* (Pat.) Maire, comb. nov. (*Otthia deformans* Pat.) causing fusiform woody galls on a species of *Philippia* in Madagascar. *C. paradoxa* agreed with the type, which Saccardo erroneously stated was found on *Abies pectinata*, a tree that does not occur in Africa; the fungus is a parasite of bamboos.

Rick (J.). **Polypori riograndenses.** [Polypores of the Rio Grande.]—*Broteria*, iii, 4, pp. 180–189, 1934.

Latin descriptions are given of 29 species of *Polyporus*, including *P. coffeae* [*R.A.M.*, xiii, p. 506], collected by the writer in the Rio Grande Valley, Brazil.

MOSSERAY (R.). **Les Aspergillus de la section 'niger' Thom & Church.** [The *Aspergilli* of the section '*niger*' Thom & Church.]—*Cellule*, xliii, 2, pp. 201–286, 4 pl. (1 col.), 1934.

On the basis of a comprehensive taxonomic and cultural study the writer has partially revised the classification of the *niger* section of *Aspergillus* proposed by Thom and Church [*R.A.M.*, v, p. 700], creating twenty new species [with Latin diagnoses] and three new combinations.

MOSSERAY (R.). **Races naturelles et variations de culture chez divers 'Aspergillus'.** [Natural races and cultural variations in some *Aspergilli*.]—*Ann. Soc. sci. Brux.*, liv, pp. 161–189, 1 pl., 17 figs., 1934.

In his studies of the genus *Aspergillus* [see preceding abstract], the writer observed in certain monospore cultures of *A. fuliginosus*, *A. malvaceus*, and *A. japonicus* localized saltations, often consisting in the reduction or suppression of sporulation with a corresponding increase of mycelial development. These mutations remained constant through a large number of subcultures. *A. wentii* produced an albino saltant (var. *alba*), in the shape of a tuft of pure white conidiophores. The mutants developed without apparent cause under normal conditions of artificial culture.

SNYDER (W. C.). **Notes on Fusaria of the section Martiella.**—*Zbl. Bakt.*, Abt. 2, xci, 8–10, pp. 163–184, 5 figs., 1934.

A full account is given of the writer's taxonomic studies in California on certain members of the section *Martiella* of the genus *Fusarium*, with special reference to the root-rotting pathogens of peas, beans (*Phaseolus vulgaris*), and potato, namely, *F. solani* var. *martii* f. 2 and f. 3 and *F. solani* var. *eumartii*, respectively. Some saprophytic species of the same group [cf. *R.A.M.*, xiii, p. 594] were included for comparison.

The differences between the strains of the pea and bean root-rotting *Fusaria* in respect of pigmentation of the culture, conidial dimensions, and frequency of septation, which originally appeared to be of specific or varietal rank, were found to be of minor significance as compared with the wide range of characteristics possessed in common by the strains of the two fungi. They are therefore regarded as only forms of *F. solani* var. *martii* and designated f. 2 n.c. (syn. *F. martii* var. *pisi*) and f. 3 n.c. (syn. *F. martii* var. *phaseoli*) [ibid., xiii, p. 668]. Latin diagnoses of the new forms are given. From a pathogenic standpoint there is a close resemblance between the symptoms caused by the three fungi. In each of the hosts the primary symptom is a reddish-brown to dark or nearly black, cortical rot of the underground stem and roots, often followed by secondary wilting.

BOURIQUET (G.). **Les maladies du Tabac à Madagascar.** [Tobacco diseases in Madagascar.]—*Ann. de Cryptog. exot.*; vii, 2, pp. 97–112, 4 pl., 1 fig., 1934.

This is a comprehensively annotated list of the diseases that have been so far recorded on tobacco in Madagascar, where the crop is extensively

cultivated in the Itassy (1,600 m. altitude) and in the Tsiribihina valley on the western coast. Powdery mildew (*Erysiphe cichoracearum*) is the chief trouble in the highlands but is very rare in the plain. The leaf spot due to a species of *Alternaria*, considered to be identical with *A. tabacina* (Ell. & Ev.) Hori [*R.A.M.*, x, p. 212], is rather frequent in the lowlands but less important in the Itassy. The same appears also to apply to tobacco mosaic, as well as to 'kroepoek' [leaf curl], Thung's common type of which [ibid., xiii, p. 806] is frequent in the valley, presumably owing to the abundance there of Aleyrodidae spp. which are known in other countries to be vectors of the disease. In 1930 a condition was first observed in the region of lake Itassy (since also found in the valley) which is locally known under the name 'tabac boka' [leprous tobacco] and which is identical with that described from South Africa by Hopkins as 'crinkling' [leaf curl: ibid., xii, p. 58]; while no evidence could be obtained locally that insects are concerned in the distribution of the disease, it is stated that most of the affected plants contained inside their stems one or more larvae of a borer insect, *Phthorimaea operculella*. Diseased buds, however, when grafted on healthy tobacco plants, produced leaves exhibiting typical symptoms of the trouble.

In addition to the above list, isolated cases were observed in the lowlands of virescence of the flowers, a variegation of the leaves without any deformation, a brown felting produced by a species of *Cladosporium* on leaves attacked by Aleyrodidae, and a blight of young plants of bacterial origin, possibly from *Bacillus* [*Bacterium*] *solanacearum*. Control measures are briefly discussed under each disease.

MANDELSON (L. F.). **The importance of Tobacco mosaic.**—*Qd agric. J.*, xlii, 5, pp. 538–545, 3 figs., 1934.

After stating that in Queensland the potential dangers of tobacco mosaic are still imperfectly realized by some growers, the author gives a brief account in popular terms of the symptoms, effects, nature, manner of spread, and control of the disease.

JOHNSON (E. M.). **Dissemination of angular leaf spot of Tobacco by the southern Tobacco worm.**—*Phytopathology*, xxiv, 12, pp. 1381–1383, 1 fig., 1934.

Evidence is briefly adduced of the dissemination of angular leaf spot (*Bacterium angulatum*) of White Burley tobacco in Kentucky [*R.A.M.*, xiv, p. 85] by the larvae of the southern tobacco moth (*Phlegethontius* [*Protoparce*] *sexta*), the organism apparently being carried by the abdominal legs, equipped with semicircular hooks which cause slight leaf injuries. This mode of spread appears to be favoured by conditions leading to dampness of the leaves.

RYAKHOVSKY (N.). ,,Скручивание листьев" Помидоров в ЦЧО и меры борьбы с ним. ['Leaf roll' of Tomatoes in the Central Tchernozem provinces and its control.]—*На Защиту Урожая* [*Crop Protection*], Moscow, *1934*, 4, pp. 24–25, 1934.

'Leaf roll' of tomatoes is stated to have become very widespread of recent years in the Central Tchernozem provinces of the U.S.S.R.,

surveys in 1933 indicating that from 16 to 97 per cent. of the plantings were infected. The real nature of the trouble has not yet been established, but it is known to have a very depressing effect on the host; field observations in 1932–3 showed that the productivity of 'leaf roll' plants was reduced by 30, 40, and up to 70 per cent. in cases of mild, average, and severe infection, respectively. The fruit from affected plants is strongly ribbed, its taste is impaired, and its weight is reduced by 6 to 23 per cent. Local experiments showed that the disease is chiefly transmitted by seed, and it is recommended that the production of tomato seed in infected regions should be prohibited.

Destructive Insect and Pest Acts, England. The Fruit Tree Pests (Cambridgeshire) Order of 1934. Dated November 26, 1934.—4 pp., 1934.

As from 1st December, 1934, the Local Authority for the Administrative County of Cambridge or the Borough of Cambridge, as the case may be, is authorized on reasonable suspicion to order the inspection and treatment if necessary of any trees, bushes, canes, and plants producing edible fruit for the presence of cankers, brown rots [*Sclerotinia cinerea* and *S. fructigena*], and apple and pear scab [*Venturia inaequalis* and *V. pirina*: cf. *R.A.M.*, xi, p. 80]. The provisions of this Order are to be enforced by the Local Authority.

Similar regulations dated, respectively, 25th January and 9th March, 1935, are prescribed for Kent and Berkshire.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst.*, vi, 8, pp. 164–166, 1934.

U.S.S.R. An Order of the People's Commissariat for Agriculture of 19th May, 1932, regulating the importation of potatoes into the U.S.S.R., prescribes that all consignments of tubers from foreign countries destined for use within or transport through the Union shall be accompanied by a duly authenticated certificate stating that (*a*) no actual or suspected case of wart disease (*Synchytrium endobioticum*) has occurred within a radius of 50 km. from the place of cultivation during the last ten years; and (*b*) the potatoes originate in a district free from powdery scab (*Spongospora subterranea*) or belong to a variety known to be immune from this disease [*R.A.M.*, xii, p. 589].

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Dutch Elm disease quarantine. Notice of Quarantine No. 70.—*U.S. Dep. Agric. Off. Inform. Pr. Serv.*, 3 pp., 1934. [Mimeographed.]

The treatment of European elm veneer logs imported into the United States having proved ineffectual in the extermination of the Scolytid bark beetles implicated in the transmission of *Graphium* [*Ceratostomella*] *ulmi*, Quarantine No. 70 [*R.A.M.*, xiii, p. 64] is amended, as from 1st January, 1935, to prohibit entirely the importation from Europe of all logs of elm and its relatives [a list of which is given] except under special permit from the Secretary of Agriculture.